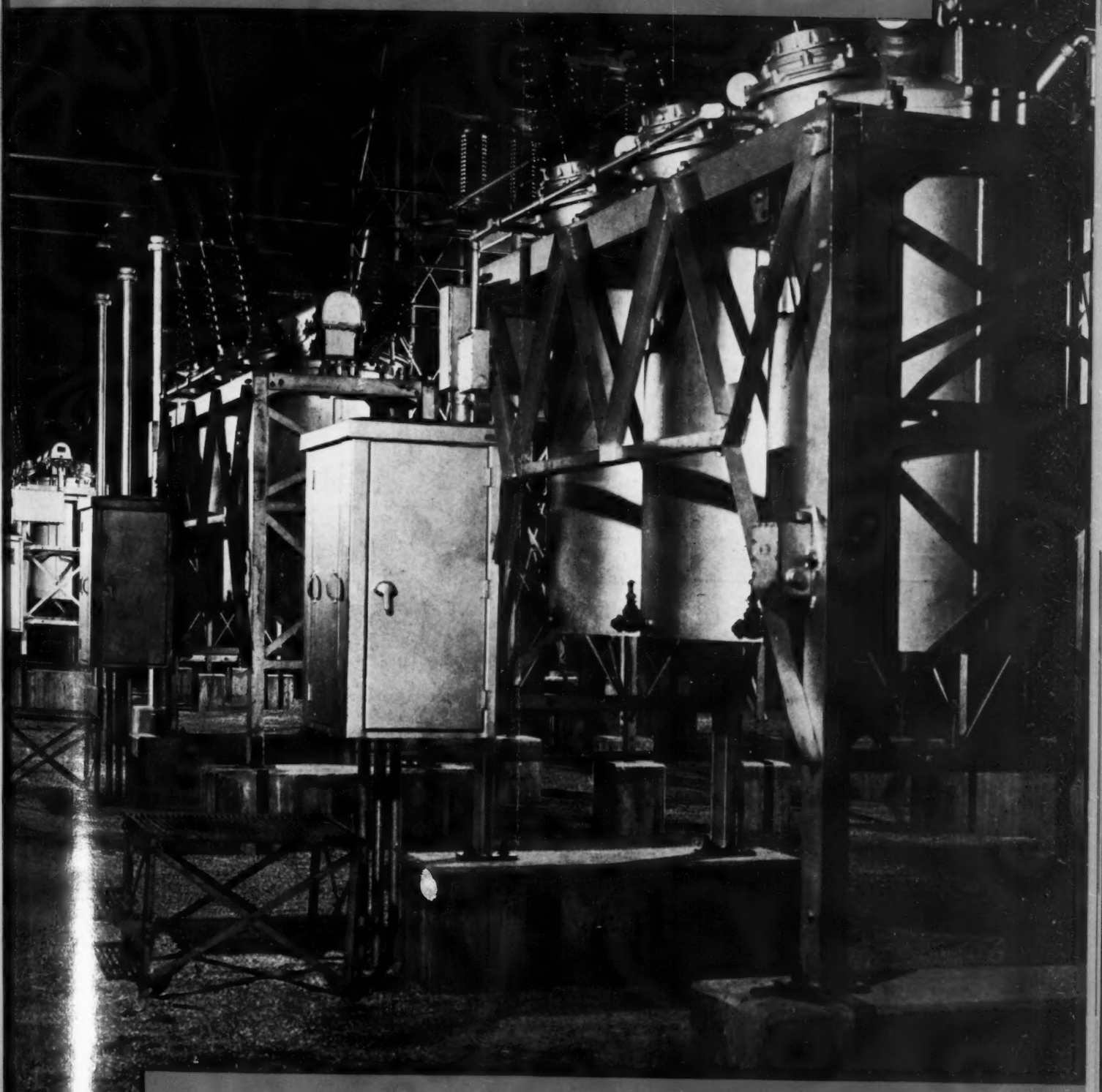
Electrical World

OCTOBER 21, 1939



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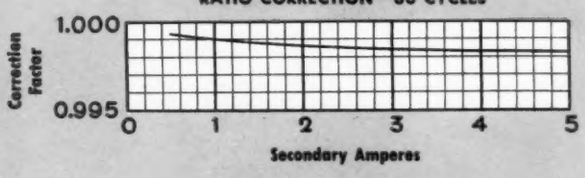
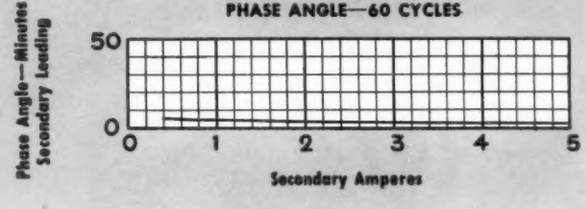


PHASE ANGLE—60 CYCLES



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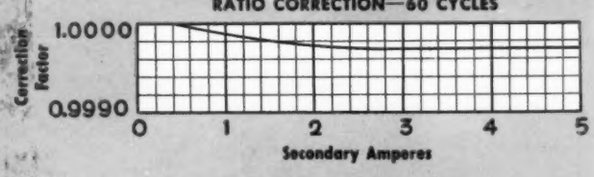

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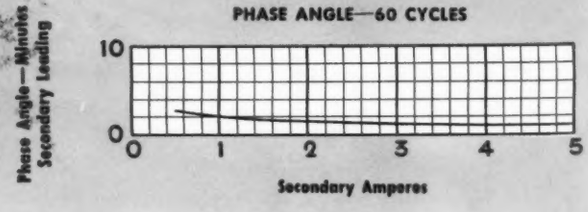

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WESTON ELECTRICAL INSTRUMENT CORP., 578 FRELINGHUYSEN AVENUE, NEWARK, N. J.

What Are the Motives?

A few weeks ago the War Resources Board, on which the War Department was depending for considerable assistance in planning the mobilization of industry, was suddenly abolished by the President. A week ago the National Defense Power Committee, under the chairmanship of Assistant Secretary of War Johnson, was also dissolved.

What are the motives back of the repudiation of committees that were bringing about an increasing degree of co-operation between private capital and government? In the case of the National Defense Power Committee, for instance, commitments were made for the immediate purchase of a million kilowatts of generating equipment, not because there was any immediate need, but rather to show the kind of co-operation the utilities could and would give if ever the need arose. Incidentally, these orders helped manufacturers to hold trained forces and prevent the possible recurrence of a skilled labor bottleneck in turbine production.

The National Defense Power Committee had surveyed the industrial power situation in every important munitions area. It had estimated the probable power use in these areas for peace time as well as war time. It had set up preferred standards for turbine design and had seen most of the new large units ordered in accordance with these standards, showing it had the co-operation of the utility industry.

Since the first work of the new National Power Policy Committee is to suggest "immediate concrete steps" to meet the needs estimated by the National Power Defense Committee, it becomes obvious that national defense is no longer paramount. If it were the War Department would long ago have insisted on greater reserves. The National Power Defense Committee had plenty of evidence that there was ample power for current needs and that before industrial production could attain any seriously large proportions utilities could put themselves in position to meet the demand.

In the meantime the suggestion was made by the public ownership group in Washington that as a matter of national defense the government should spend half a billion dollars or more on heavy interconnection. The National Power Defense Committee did not sponsor the suggestion. There was also the suggestion that the government might erect emergency plants in strategic locations. Since the co-operation of the utilities with the National Defense Power Committee indicated no need for such plants, nothing ever came of the suggestion.

However, when we read the President's words—"immediate concrete steps"—we wonder if perhaps these ideas and others might not blossom forth again. Under the Federal Power Act and the National Defense Act the President has certain broad powers which may possibly be interpreted to give him authority to take immediate steps without specific enabling legislation.

That any such action with its implications should be taken at this time, when the utility industry has kept faith by spending more money (TVA, Nebraska, Lower Colorado and government financing of municipal projects being behind them), is without justification, especially if no national emergency is imminent nor any power shortage threatened.

Limited Cooling Water Fixes Semi-Outdoor Plant Design

Deficient surface water supply dictates use of wells and cooling tower at new Ripley station — Natural gas fuel with oil reserve — Manual combustion control—Station is simple, attractive, efficient

S. B. FLAGG, *Mechanical Engineer, Ebasco Services, Inc., New York, N. Y.*

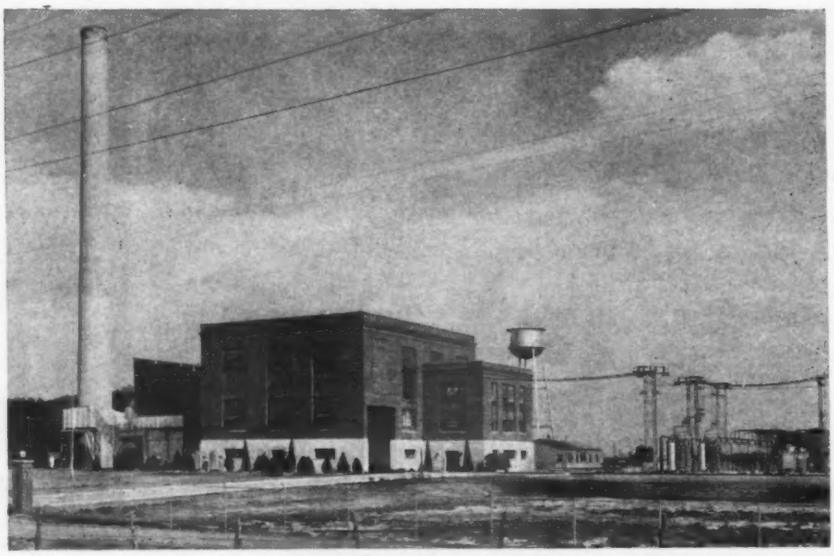


Fig. 1—Ripley station, named for ranking executive of Kansas Gas & Electric Company

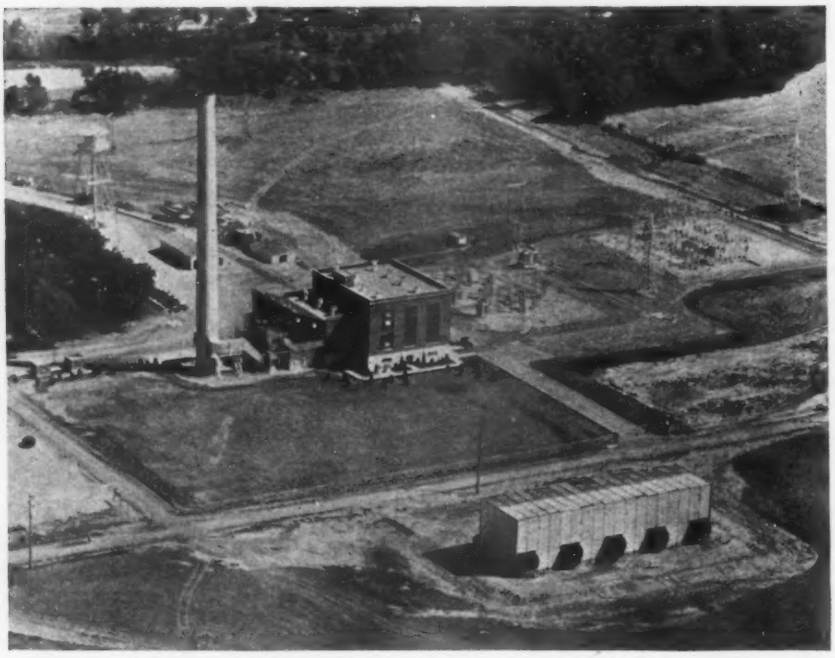


Fig. 2—Aerial view of site from northwest, showing switchyard to south, cooling towers at right. Little Arkansas River curves about the plant to the left

SUBSTANTIAL reduction of investment was effected by the use of semi-outdoor design for Ripley station of Kansas Gas & Electric Company and twelve months of successful operation have justified the adoption of this design. Boiler equipment is partially exposed to the weather; structures housing boiler operating space, turbo-generator and auxiliaries and electrical controls are compact; spare or duplicate equipment is kept to minimum, and general design is simple. Condensing water conditions presented a difficult problem, met by using forced-draft cooling tower and obtaining make-up from shallow wells. Fuel is natural gas; steam temperature is controlled by gas bypass damper. Fig. 1 shows the pleasing appearance of the station, to which landscaping and neat "housekeeping" contribute. Even severe winter weather fails to complicate operation or adversely affect results. The station supplements an older station located in the heart of Wichita and a coal-burning plant in eastern Kansas.

When growing system loads in 1937 called for more generating capacity for Kansas Gas & Electric Company the choice of a site for its installation might have been in southeastern Kansas, where also it had a generating station and a considerable load in and around the Pittsburg coal mining area. Extension of its coal-fired Neosho station, near Parsons, would have presented no particularly difficult problems in respect of water or fuel supply. A 132-kv. steel tower transmission line already connected that station to transmission and distribution lines in central Kansas, served also by its

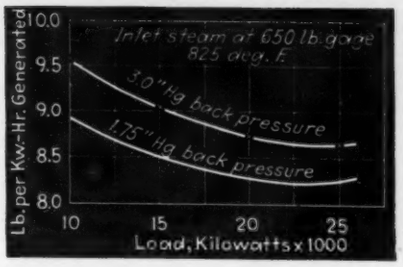


Fig. 3—Turbine water rates—no bleed. Inlet steam at 650 lb. gage, 825 deg. F.

gas-fired station in Wichita. Proximity to load center and availability of an adequate natural gas supply favored the selection of a central Kansas location, although extension of Wichita station was inadvisable for several reasons.

For those accustomed to areas blessed with greater annual precipitation or crossed by streams of sustained flow it may be difficult to realize the problems attending selection of a station site in territory where minimum annual rainfall is only about 15 in. and where rivers are in flood at certain times and at others carry practically no flow. Sites in south-central Kansas with adequate direct-flow condensing water, or even where a supply can be impounded for a power plant of 50,000 kw. capacity, are difficult, if not impossible, to find. The quality also of the best of natural waters in that area is none too good and that of certain streams is very poor.

The Cooling Water Angle

Extensive studies begun as early as 1930 finally led to the selection of a site for the 23,000-kw. Ripley station, about 5 miles north of Wichita on Little Arkansas River. Since for a large part of the year river flow is so low that recirculation of condensing water would be necessary, a design predicated on either spray pond or cooling tower was dictated. The final decision to use a forced-draft tower conduced to conservation of water and better cooling result. Although river water for make-up for cooling tower and boilers and to meet station requirements might have been obtained during most or all of the year, it was found that a more dependable supply, carrying approximately equal dissolved solids and not requiring filtration, could be had from moderately shallow wells. Two wells of 1.7 c.f.s. (375,000 lb./hour) normal and 2.1 c.f.s. (500,000 lb./hour) maximum capacity each were therefore sunk, and each pumps into a house service system on which a 400,000-lb. overhead tank floats.

Semi-Outdoor Design

Notwthstanding the fact that in winter zero temperatures will occasionally be encountered, favorable experience at other stations designed by Ebasco Services, Inc., resulted in the adoption of a semi-outdoor station design as shown in Fig. 1, because of substantial savings in building cost. The aerial view, Fig. 2, shows the general arrangement of the station, yard and cooling tower.

The main building structure, the interior of which is finished in buff brick, completely houses office, control and battery rooms, laboratory, turbine room and auxiliary bay, as well as machine shop, space for stores, lavatories and lockers, and a small assembly room. Office and control rooms are served by air-conditioning units. A low extension of the main building incloses boiler firing aisle and controls, while a canopy of asbestos-protected metal over boilers affords shelter above and between them. All fans and preheaters are exposed to weather, as are their weatherproof driving motors.

Ground water stands at about 15 ft. below surface and water-bearing

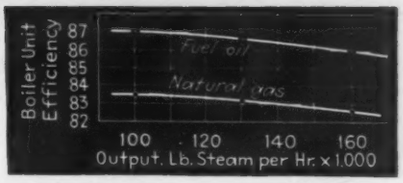


Fig. 5—Over-all efficiency of boiler unit

Boiler Efficiency	B.t.u./Net Kw.-Hr. Output
83 per cent	13,500
81 per cent	13,830
79 per cent	14,150

sands extend to a depth of approximately 47 ft., below which is a hard clay. Although soil tests indicated that loads on the foundation might have been safely carried by spread footings without piling, there was the possibility that a flood might scour out around the building and undermine the foundation unless it were inclosed by sheet piling; it was therefore decided to pile the whole area. A total of more than 900 creosoted piles ranging in length from 32 to 40 ft. were used under walls and equipment foundations. Provision is made to extend the station building to the east by removal of a temporary wall as additional capacity is needed.

Steam conditions selected are 650 lb. gauge and 825 deg. F. total temperature at turbine throttle. Figs 3 and 4, respectively, show curves of turbine water rates at two back pressures and heat balance diagram

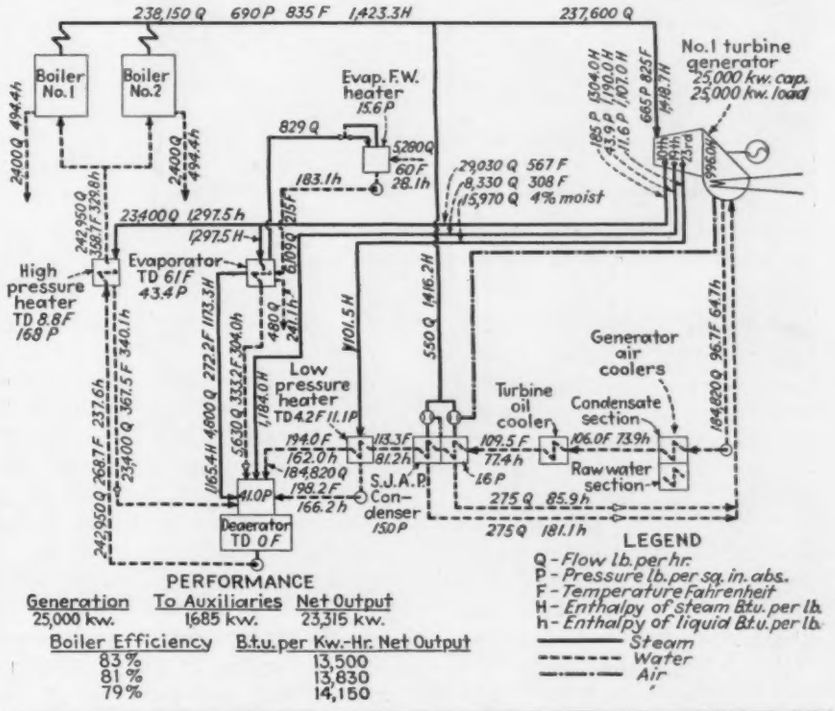


Fig. 4—Heat balance of 25,000-kw. unit. Under conditions of 1.75 in. (mercury) back pressure and 25,000-kw. load on generator. Net output 23,315 kw.

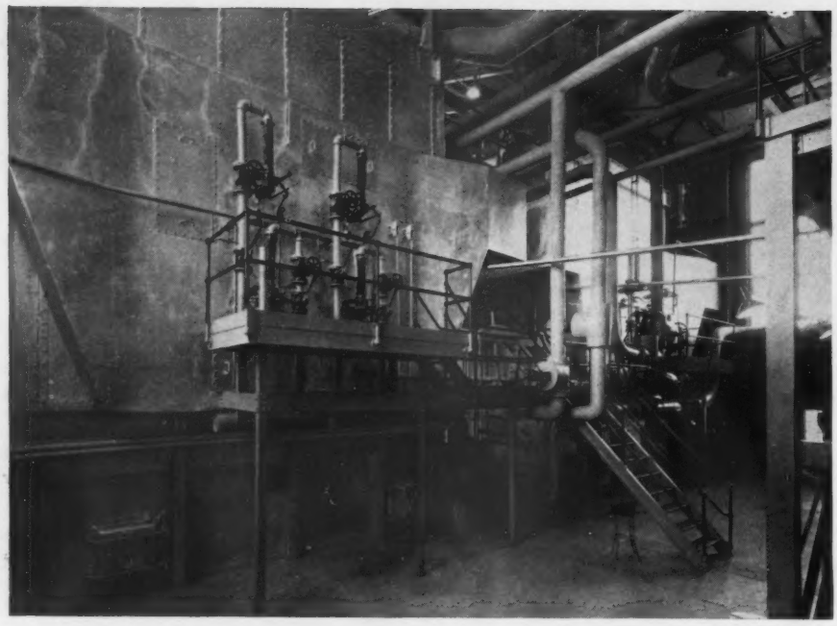


Fig. 6—View of boilers from near boiler gage board, showing platforms at fuel burners

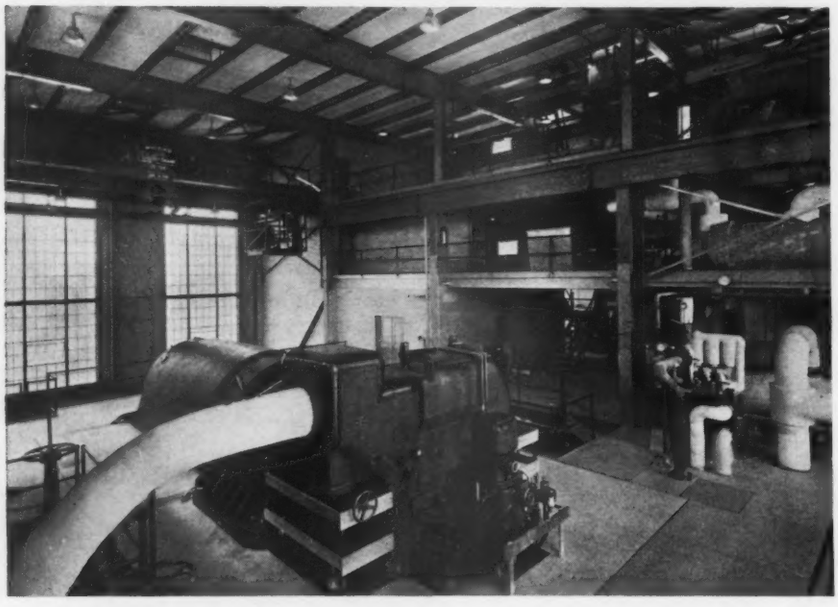


Fig. 7—View of turbine room showing auxiliary bay, storeroom, washroom and laboratory. Boiler firing aisle is beyond auxiliary bay

for full load condition. Because of its higher thermal economy and lower production costs, Ripley station is naturally given preference in apportioning system load and it operates at approximately 70 per cent monthly load factor.

A 29,150-sq.ft., two-pass steel-shell condenser with tubes of arsenical copper is bolted directly to turbine exhaust nozzle and is spring-supported.

Circulating water piping is also steel and gave some trouble from vibration inside building until it was partially incased in concrete at certain points so as to dampen the vibration.

A single circulating pump delivers 70.8 c.f.s. through the condenser to a forced-draft cooling tower located some 325 ft. from the station and on the opposite side of a public highway that divides station property. The tower is arranged in three sections and has nine airplane-type fans with direct motor drives, so that the fans in service can be regulated according to the cooling requirements.

A typical analysis of well water shows as follows:

Hardness	330 p.p.m.
Alkalinity (mo)	222 p.p.m.
NaCl	60 p.p.m.
Na_2SO_4	80 p.p.m.

Considerable study was given to the question of the most economical way to treat this water for tower make-up, so as to avoid corrosion attacks and scale deposits on condenser tubes. Decision was finally reached to try out the use of "Calgon," a sodium metaphosphate. Present practice is to limit concentration to approximately 400 p.p.m. alkalinity as $CaCO_3$ in the circulating water. Treatment involves the addition of 5 lb. of chlorine and 12 lb. of Calgon per day. The chlorine treatment is a single dosage, while the Calgon is added throughout the day by dumping into a wire basket hanging in flow from the cooling tower, where it is dissolved. A Calgon residual of approximately 3 p.p.m. is maintained; this calls for a dosage varying somewhat with the season. Experience so far indicates that this method of treatment will prove satisfactory and economical. For feed to the evaporators this same well water is treated in zeolite softeners.

Convertible to Pulverized Fuel

Natural-gas fuel is supplied from a main gas transmission line through a branch some 5,500 ft. in length. For emergency use a 3,000-bbl. tank is maintained full of fuel oil, and additional storage of oil for the use of both Ripley and old Wichita stations is maintained in a 55,000-bbl. tank 3 miles from the new station.

Steam-generating equipment includes two Combustion, type VU, integral-furnace boilers completely steel-incased, each with a capacity of 160,000 lb. of steam per hour and fired by four forced-draft mechanical oil and gas burners. Damper-controlled gas by-pass is provided to vary the quantity of combustion gases passing over the superheater, so as to control steam temperature.

While it is expected that natural gas will be used as fuel for a considerable number of years, the design is such that conversion to pulverized coal firing could be made at a later date without great difficulty. A sufficient area along the railroad siding is reserved for fuel storage if change to coal is made. The over-all boiler unit efficiency at various steam outputs is shown in Fig. 5, and Fig. 6

[*Continued on page 48*]

Distribution Planning—II

Residential Loads, Diversities

Value and distribution of residential loads is necessary to intelligent design of system — Use of diversities in layout of transformer-secondary combinations — Method used to systematize design

C. E. ARVIDSON, L. D. CRONIN, *Commonwealth & Southern Corporation, Jackson, Mich.*

AN ADEQUATE and reliable knowledge of residential load characteristics is essential for designing urban residential distribution systems, especially transformer-secondary combinations. Transformer-secondary combinations must be designed to carry the maximum recurrent loads without (1) exceeding the permissible voltage drop for the combination and (2) without exceeding the thermal ability of the transformer.

The advent of the electric range has made it especially impractical to determine transformer loadings by 24-hour field measurements, since transformer loads vary considerably from hour to hour and from day to day. Field measurements, to be reliable, must be taken over a long period and are, therefore, generally too costly to be practical. Furthermore, field measurements do not give any indication of the distribution of loads along the secondary, and where ranges are involved the secondary loads may be far from uniformly distributed. Therefore, a knowledge of secondary load distribution is essential for making secondary voltage calculations.

Method of Study

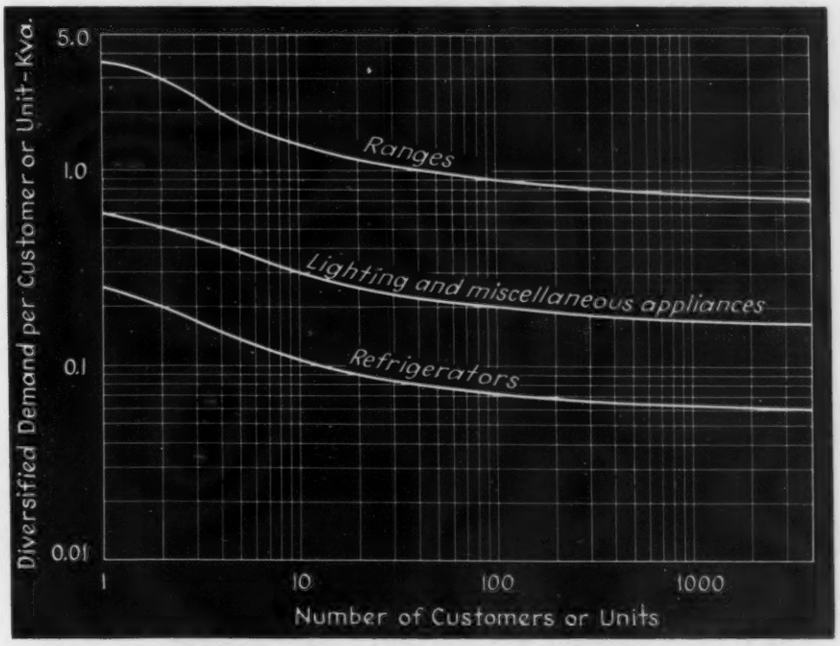
Statistical methods for determining residential loads and diversities are being used by many companies. Many field surveys have been made to determine the characteristics of loads created by residential utilization equipment. The results of these studies indicate that the character of these loads is surprisingly similar, despite wide variation in location or economic status of the customer, and that it is entirely feasible to use a statistical method for the prediction of residential loads.

In studying the characteristics of residential loads two independent factors must be considered: (1) The diversified demands for each type of utilization equipment and (2) the hourly demand variation factor.

For design consideration the diversified demands are taken for a sustained time interval lying between two minutes and fifteen minutes resulting in demand values consistent with good service and economy. These values represent recurrent demands and may at infrequent intervals be somewhat exceeded.

The "hourly demand variation factor" has been devised to show the probable hourly variations of the demand for each of the various types of appliances during the day. This factor is for use in combining the demands for different types of appliances. For instance, if the peak range demand occurs at 5:45 p.m. and the peak lighting demand occurs at 8 p.m., then in order to add the lighting peak to the range peak the lighting peak would be multiplied by its variation factor for 5:45 p.m. On the other hand, if the range demand were to be added to the lighting demand at 8 p.m., then the range demand would be multiplied by its hourly variation factor for 8 p.m.

It is of interest to note that range saturations as low as 5 per cent may be the dominating influence on resi-



Demands per customer for any number of customers and for three groups of appliances

Note—Multiply values from curves by the following percentages (hourly variation factors) to obtain the total diversified demand for urban systems:

Lighting and miscellaneous..	**90 per cent**
Refrigerator	**91 per cent**
Ranges	**100 per cent**

Example—Probable peak demand for 30 customers:

		Kva.
30 lighting customers	30×0.23×0.90	6.2
15 refrigerators	15×0.096×0.91	1.3
10 ranges	10×1.35×1.00	13.5
Probable demand at time of peak		21.0

Diversified Demands and Demand Variation Factors for Residential Loads

Number of Customers or Units	Kva. Demand per Customer or Unit			
	Lighting and Miscellaneous	Refrigerators	Ranges	On-Peak Water Heaters
1	0.60	0.250	3.6	1.50
5	0.38	0.135	1.75	1.20
10	0.30	0.108	1.36	1.06
20	0.25	0.090	1.13	0.95
30	0.23	0.084	1.06	0.90
40	0.22	0.080	1.00	0.89
80	0.20	0.074	0.89	0.85
150	0.19	0.070	0.86	0.80
250	0.18	0.067	0.82	...
500	0.175	0.065	0.79	...
1,300	0.17	0.062	0.75	...

Time	Hourly Demand Variation Factors in per Cent				
	Lighting and Miscellaneous	Refrigerators	Ranges		On-Peak Water Heaters
			Urban	Rural	
2:00 a.m.	10	78	0	0	27
4:00 a.m.	6	78	0	0	15
6:00 a.m.	17	75	6	6	16
8:00 a.m.	43	78	50	49	73
10:00 a.m.	33	79	28	30	100*
12:00 noon	25	89	59	100*	94
2:00 p.m.	25	89	14	17	79
4:00 p.m.	40	89	23	16	76
5:45 p.m.	90	91	100*	92	71
6:00 p.m.	95	92	90	95	70
7:30 p.m.	99	100*	..	..	..
8:00 p.m.	100*	95	7	14	75
10:00 p.m.	78	88	2	2	60
12:00 p.m.	36	90	1	1	45

* 100 per cent indicates peak for particular type of equipment.

dential circuits. The accompanying table gives the diversified loads of various types of appliances and various numbers of customers, together with the hourly demand variation factor in per cent for a 24-hour period.

Factors of Calculation

A discussion of the diversified demands and hourly variation factors for each type of equipment follows:

Lighting and Miscellaneous Appliance Demands—Although the demands created by residential lighting and small appliances vary considerably, it has been found that a short time demand of 0.6 kva. is reasonable for a single average lighting customer. Using 0.6 kva. as a base demand for lighting and miscellaneous appliances the data in the table have been compiled to show the diversified demands which can be expected per customer for one or more residential customers. This table also shows the hourly demand variation factors which apply to these diversified demands when they are to be combined with demands produced by other loads.

Refrigerator Demands—The demand of an average refrigerator is found to be about 0.25 kva. Using this as a base demand for refrigerators, the table shows the demand which might be expected per customer for one or more refrigerators. Unlike lighting and cooking equipment, a single refrigerator load is either all on or all off. There is, however, an hourly demand variation for several units which can be expressed in per cent of demand.

Range Demand—A study of the demands created by a large number of ranges indicates that about 3.6 kva. represents the demand of an average electric range. This demand may be exceeded at times, as when the oven is being preheated, but it has been found that this value is exceeded so infrequently and for such short intervals that a higher value for design purposes can hardly be justified. Using a base demand of 3.6 kva. for one range the table shows a diversified demand that might be expected from any number of ranges, together with the hourly variation factor.

Water Heater Demand—The demands which may be expected from a water heater will be the rating of the heating unit or the rating of the larger unit if two interlocked units are installed. There will, of course, be some diversity between a number of "on-peak" type water heater installations. The table has been prepared to show the demands which might be expected from one or more 1.5-kva. "on-peak" water heaters. The percentages represent the hourly demand variation factors.

"Off-peak" water heaters have very little diversity unless the "off-peak" hours for various customers are staggered. They need not be considered in distribution design unless (a) their undiversified demands per transformer or portion of secondary exceeds the diversified range demand or (b) they create peak demands during the "off-peak" hours.

Combination "off-peak" and "on-peak" water heaters having one bottom unit controlled for "off-peak" operation and a top unit for operation at times when the hot water supply is almost exhausted represent another condition to be considered. There will be little, if any, diversity between the "off-peak" units of these heaters, but the diversity between the "on-peak" units of these heaters will be very much greater than for single-unit "on-peak" water heaters. Due to the many classes of water heaters and the many possible combinations of units and tank sizes, only the 1.5-kva. "on-peak" heater is shown in the table as representative of "on-peak" heaters.

Result of Diversified Demands

Unless the portions of the distribution system under consideration have no electric ranges the maximum demand on an urban distribution circuit will occur in the winter between 5:30 p.m. and 6 p.m. Occasionally, in rural communities where the cooking habits are different, it may be found that the maximum demand will occur from 11 a.m. to 12 m. By applying suitable hourly variation factors with respect to the dominant load, it is possible to calculate demands of any residential circuit, or portion thereof.

The curves show the diversified demands per customer for any number of lighting customers from 1 to 4,000, for three groups of appliances, namely, lighting and miscellaneous, refrigerators and ranges. Water heaters are not included due to the many possible combinations of units and tank sizes existing for both "on-peak" and "off-peak" heaters. A sample calculation is shown for determining the demand for 30 customers, fifteen of whom have refrigerators and ten of whom have ranges, the basis of the calculation being that the ranges are the dominating load influence.

• "Design of Radial Primaries" is the subject of the next (third) article in a series of six on the technique of distribution design and analysis and will appear in "Electrical World," November 4. Reprints of the six articles collected in a stiff cover binding will be available when the series is completed. Edition will be limited and orders should be sent in early.

Utility Promotion Draws Thousands to Radio Shows

Pacific Power & Light merges efforts of 105 dealers—Provides promotion and exhibition facilities in order to attract public attention in luncheon club meetings, school assemblies and parades

D. B. LEONARD, ***Commercial Manager Pacific Power & Light Company, Yakima, Wash.***

THE showing of 1939 radios sponsored by the Pacific Power & Light Company drew 36,787 people and established a new all-time attendance record for radio shows of this type, which have been held each year for the past four years in Oregon and Washington. A total of 105 dealers co-operated in staging mock broadcasts in eighteen cities to bring radio fans to the exhibits, where a total of 23 different models of new 1939 radios were shown.

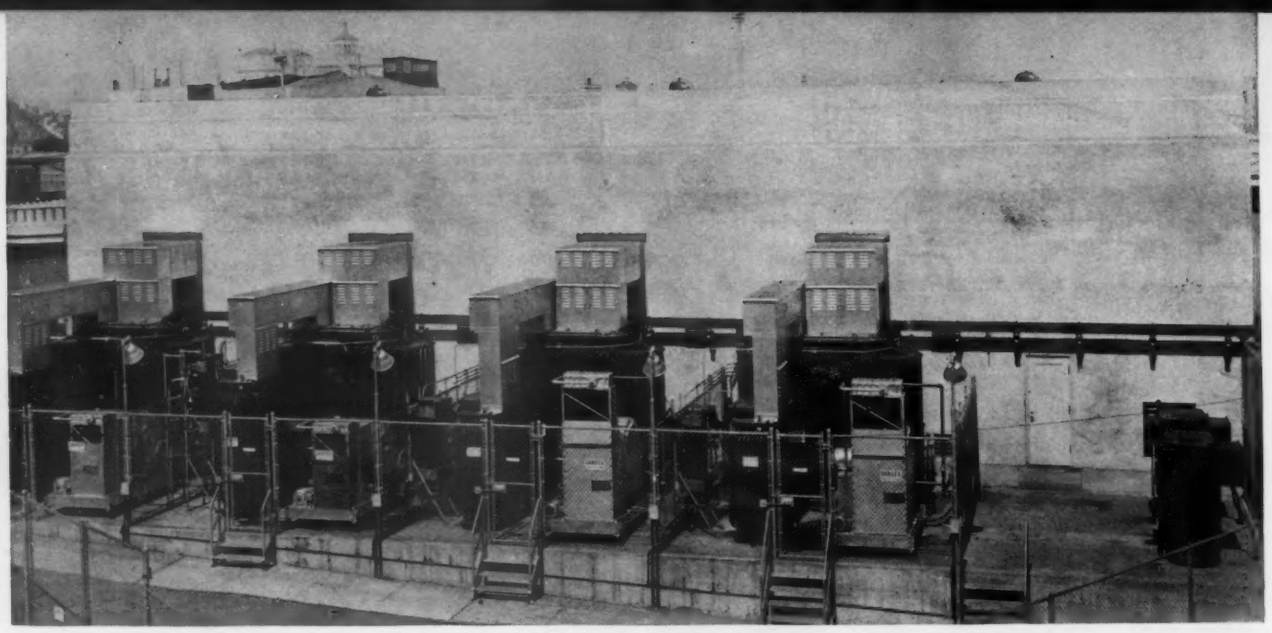
For the past four years large halls or dance pavilions and the publicity, advertising and entertainment have been provided by the Pacific Power & Light Company for dealer shows of radios, and dealers have been invited to participate by decorating booths to exhibit their particular brands of new model radio sets. Extensive newspaper advertising by all co-operating agencies have provided attention-drawing publicity to make the Radio Show the number one event in the community on the day of the event. Radio announcements, hand bills, direct mail invitations and telephone calls have been used as needed to bring capacity crowds to the exhibits.

The past year a troupe of radio entertainers, known as the KGW Oregonian Trail Blazers, were secured to appear at the series of programs. They made it a special order of business while on the tour to appear daily before school assemblies or luncheon clubs to provide special musical programs for their entertainment. During the course of the shows they appeared before ten clubs and 23 school groups with an attendance of 13,660, which helped to advertise the afternoon and evening performances in the community halls where the radios were exhibited. Before and after each performance attention was directed to the new model radios, where dealers pointed out the advantages of each set to packed booths, full of eager listeners and prospective purchasers.

Utility promotes overflow meetings—105 dealers display their radios to 50,000 people in shows promoted by Pacific Gas & Electric

Dealers at The Dalles, Oregon, initiated an original plan that helped materially to publicize the show in that community. Early in the evening the dealers staged a parade with the show troupe as musicians and with large banners and placards announcing the show. The line of march led to the city outskirts, where a bonfire was started of old radio sets. Each dealer added to the program by tossing a few obsolete sets on the fire to dramatize their worthlessness as compared with the 1939 models. The parade returned through the main streets to end at the community hall, where the followers visited the Radio Show to score a new high in attendance.

The 36,787 who attended the shows, added to the 13,660 at outside performances, provided a spread of influence that actually enabled 50,447 people to see and hear real radio stars in action. The 105 dealers who co-operated exhibited 23 different makes of radios and reported that many sales were completed and that large numbers of prospects were secured for future sales. The Pacific Power & Light Company demonstrated methods it uses to eliminate radio interference, showed pictures of its physical facilities and communities served and considered this promotion of radios one of the most successful it has ever staged.



Sterling substation is a windowless, steel-frame structure of modern architectural design. The roof is a single concrete slab, sloped for drainage. Outdoor buswork is steel inclosed to save space. 1,300-volt units at right, 625-volt at left

Improved Design of Details for Rectifying Substation

Channel shunts of silicon bronze save space — Portable degassing equipment improved — Various types of inclosures make for safety and reliability

F. S. BENSON, *Engineering Department, Pacific Gas & Electric Company, San Francisco*

STERLING substation, energized early this year, takes 12-kv., 60-cycle, three-phase power and delivers direct current at two voltages to electric trains operating on the San Francisco-Oakland Bay Bridge. Operated by, and eventually to be the property of, the Interurban Electric Railway and the Key System, it was designed by Pacific Gas & Electric Company.

Larger stations can be found elsewhere, performing essentially the same functions and employing similar equipment. However, in the design of Sterling, as is usually the case on any large job where economy and efficiency are sought, certain details were developed which may be of general value. Treated herewith are a few of the more unusual design features which relate directly to rectifier equipment.

Sterling substation houses 12-kv. switching equipment, two 2,000-kw., 625-volt rectifiers, two 2,500 kw., 1,300-volt rectifiers and d.c. switching equipment for each voltage. Main and interphase transformers are located on a platform outside the substation wall, one set being associated with each of the rectifiers, which are steel-tank, mercury-arc, twelve-anode units. All lines to and from the substation are underground. The station is semi-automatic, completely remote-controlled.

Building Design

The fact that the station will normally be unattended made it practicable virtually to seal the building. However, a large door at one end permits installation or removal of equipment, while a smaller one at the opposite end provides a second exit for personnel in case of fire. A steel frame supports concrete walls and roof, which are free from windows and skylights. This unbroken construction reduces the chance of weather leaks and keeps the station cleaner.

Three rotary vents in the roof allow heated air to escape, while an opening in one wall, covered with screen and louvers, is so designed that cooling can be increased by addition of a blower, should such be found necessary in the future.

Fire-protective equipment consists of a 50-lb., CO_2 gas, portable fire extinguisher, two 7½-hp., CO_2 Lux extinguishers and two 1-gal. Pyrene extinguishers.

A series of thermal links is installed near the ceiling over each switchgear assembly. Temperature of 175 deg. F. will melt a link, thus releasing a weight and mechanically closing a contact. This action energizes the relay in the supervisory-control system which gives the remote indication. Thus excess temperature will initiate a fire signal

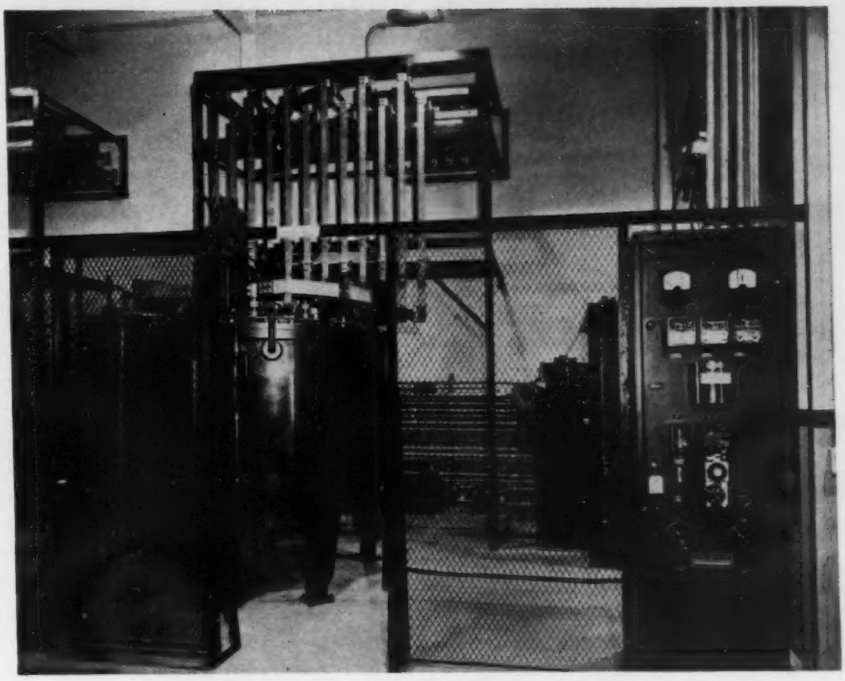
in the controlling substation—in the form of an audible alarm as well as a red light labeled "fire."

Rectifier Inclosures

Each rectifier, the exposed tank of which operates close to line voltage, is inclosed in a wire-mesh cage. A scheme is employed whereby the possibility of a person's contacting a hot rectifier is nearly nil. Each rectifier can be reached only through a gate in the inclosure. Adjacent to the gate is the rectifier control panel. The key to the inclosure gate is kept behind the control panel. Opening the panel door causes an interlock switch to open and shuts down the rectifier by tripping it off both a.c. and d.c. buses. Removing the key from the control panel opens a second interlock, in series with the first. Opening the inclosure gate likewise opens a third interlock, also in series. (A fourth interlock switch is installed in the gate to each outdoor transformer inclosure.) The key cannot be removed from the gate lock until the gate is closed and locked again. By providing a different key for each rectifier inclosure a sequence of operations is required such that the rectifier must be de-energized before the inclosure can be entered.

Rectifier Panels

The panels are themselves unusual. The front panel is built of steel and is hinged and the rear panel is ebony asbestos. The front one is flush with the rectifier inclosure and carries relays operating at 125 volts d.c. or 220 volts a.c. Voltage-regulating equipment and other multi-pole contactors which are energized at rectifier potential are mounted on the rear panel. Opening the front panel de-energizes the rectifier, according to the scheme described above. Thus an attendant may safely work on wiring, some of which otherwise would be at rectifier potential. The panel inclosure is grounded.



Rectifier inclosure. The gate appears at left, rectifier behind. At right is the associated panel

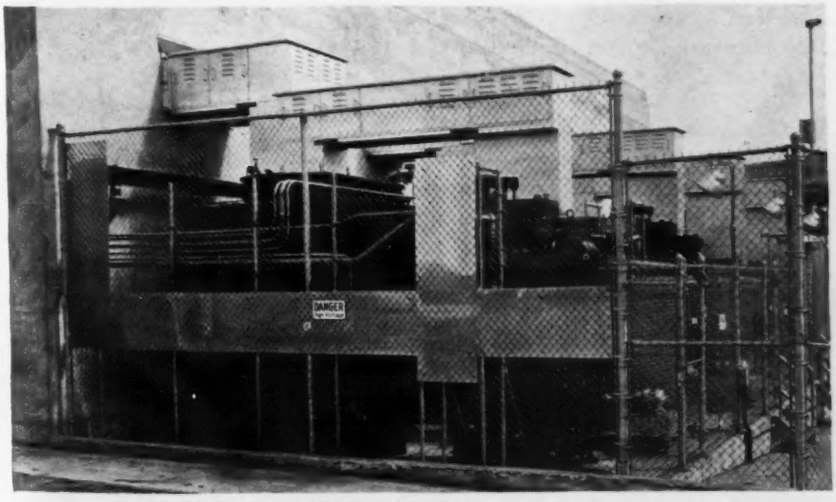
Because of close spacing, it was deemed advisable to inclose the connection bars serving a twelve-phase rectifier from the point where they leave the associated outdoor transformers to the substation wall. Leads from interphase to main transformers are similarly inclosed.

The housings consist of a steel frame, forming a rigid structure, supported at one end by the transformer and at the other end by the substation wall. The frame is covered by a sheet-steel roof, made rain-tight; it has removable side sheets. The latter are louvered to increase ventilation and are backed with fine-mesh screen to prevent entry of small birds, etc. The same type of screen is used underneath. Conventional plates and angles, mounted on the frame, carry the weight of the anode busbars through insulating supports. The assembly is galvanized.

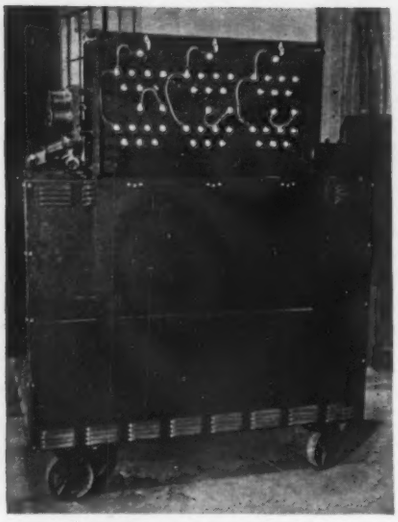
Channel Shunts

In connection with the grid control, it is necessary to furnish voltage to the compensating winding of the voltage regulator from 400-millivolt shunts. By employing silicon-bronze alloy (which has constant resistance-temperature characteristics) in the form of channels, mounted vertically to improve ventilation, it was possible to make them only 4 ft. 6 in. long. These units are outdoors.

The outdoor equipment is inclosed by wire fence, but at some points cooling water pipes from the heat exchanger to the rectifier and copper from the main negative bus to the interphase transformer are supported near the inclosure fence. To forestall



Live parts near fence are shielded with aluminum



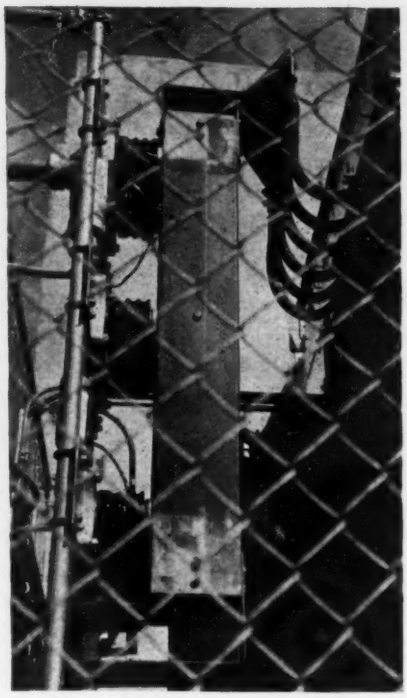
Terminal block, ammeter and shunt, on portable degassing equipment

the possibility of passersby touching live parts with pencils, or other objects, metal shields consisting of 16-gage aluminum were fastened to the wire fence by means of conventional line clamping lugs. Aluminum was used both because of its resistance to rust and its resemblance to other parts of the structure which are galvanized.

Not specifically a part of Sterling substation only, but used in connection with all three of the similar substations which serve the bridge railways, are two bake-out equipments. The factory-built product, provided with taps for degassing either 625- or 1,300-volt rectifiers, was compactly arranged in a single assembly, mounted on rollers. The addition of some auxiliary equipment, however, was made for added convenience.

A terminal-block arrangement was built on top of the bake-out equipment frame. In addition to terminals from which the appropriate degassing current could quickly be selected, the equipment was provided with a shunt and ammeter by means of which current flowing from the cathode could be read. These additions considerably increased the convenience of the assembly and served to keep the floor area around a rectifier clear of miscellaneous equipment. The resistor, used with above assembly, was retained as a separate piece of equipment.

The bridge substations have been in service for several months now.



Use of silicon copper in channel form saved space and cost in installing shunts

Devices and equipment described above have proved entirely satisfactory.

Limited Cooling Water Fixes Semi-Outdoor Plant Design

[*Continued from page 42*]

is a view of boiler fronts showing arrangement of burners and platforms. Regenerative heaters preheat combustion air to about 450 deg. F.

Control of steam pressure and of combustion conditions is almost wholly manual. Boiler feed is under three-element automatic control. Fuel feed is regulated manually from boiler panel board; induced draft is manually controlled by air remote control from that board, and forced draft is regulated automatically to maintain a predetermined furnace negative.

12-Kv. Bus Outdoors

Main generating unit is a Westinghouse 23,000-kw., 0.92-power factor, 25,000-kw., 1.0-power factor, three-phase, 60-cycle, 12,500-volt, 3,600-r.p.m. turbo-generator, with 250-volt main and pilot exciters. Generator is air-cooled. Transient reactance is 11 per cent and short circuit ratio 1.25. Generator output is delivered through a copper tubing main lead inside the building and thence by copper cable span to a 12-kv. outdoor bus in switchyard. Between the generator and its oil switch outdoors leads are tapped to supply power for station use through a 2,500-kva., 12,500/2,400-volt transformer having disconnects on its high side and on the low side an oil switch to tie to station auxiliary bus. Alternatively this auxiliary bus can receive energy from a 12-kv. bus through a similar step-down transformer. Either transformer is adequate to carry station auxiliary load. Auxiliary power switchgear comprises a 2,300-volt, single bus and steel cubicles inclosing thirteen removable oil circuit breakers which serve all motors above 100 hp. in size. Smaller motors are served from a 440-volt, single-bus, metal-clad switching structure inclosing fifteen withdrawal type air circuit breakers. Power is supplied from 2,300-volt to 440-volt switchgear through either of two 450-kva., 2,300/440-volt transformers, each being of sufficient capacity to carry 440-volt auxiliary load. All auxiliary transformers are outdoors.

The 12-kv. switchyard is of open "low"-type design and includes six 20-ft. bays. It has both operating and inspection buses supported on steel structures. The operating bus is connected through oil circuit breakers to the generator, to three 12-kv. feeders serving Wichita and an outlying industrial district and to a 15,000-kva., 12-kv./66-kv. transformer located intermediately between 12-kv. and 66-kv. switchyards. At present only the three 12-kv. feeder circuits are connected to the inspection bus, but future circuits can be connected when required.

The 66-kv. switchyard, also of low type design, consists of four 30-ft. bays with only an operating bus at present, although provision has been made so that an inspection bus can be added when required. The picture on the front cover of this issue gives a glimpse of the switchyard arrangement under the effective sodium-vapor lighting used. Both 12-kv. and 66-kv. switchyards are so arranged that they can be extended at either end.

Ebasco Services, Inc., served as consulting engineers for the project.

Commercial Customer Surveys Show Attractive Potentials

High average usage at compensatory rates, with long hours of use and a fair degree of diversification, offer an important load-building field for utilities

JOHN B. WATKINS, *Assistant to Manager, Lighting and Wiring Sales, Commonwealth Edison, Chicago*

THE small commercial customer offers one of the most attractive fields for utility promotional efforts. Constant lowering of rate levels, and particularly the introduction of the block form of rate, has greatly expanded the potential possibilities for the use of electrical equipment, and, therefore, the use of electric service. It is among this group that the "face lifting" or store front modernization movement has gained such popularity in the last few years. Also, this class of customer includes the "luncheonette" group, where counter cooking devices offer an attractive field of development. It is the small commercial customer that furnishes the market for package-unit refrigeration, beverage coolers and self-contained 3- and 5-ton air-cooling units. Generally speaking, small stores are as badly under-wired as are residences, therefore any adequate wiring campaign should cover this class of customer. During the past few years, when, on account of the depression, there was a tendency to cut down the wattages used in existing fixtures, special lamp-replacement campaigns have been profitable.

Steady Growth Customers

While, because of general economic conditions, during the last few years, there has been a fairly high mortality rate among small stores and shops, which has resulted in temporary increases in the number of vacant stores in some localities, the small commercial group on the whole is a fairly steady growing user of electric service, being much less subject to violent fluctuations in their use of electrical energy than are larger industrial customers. This fact, coupled with the fact that among this class of customer are found the longest hour users of electric service, makes this a particularly worth-while group to cultivate, now that business is on the upgrade again.

By this time it should be obvious that the kind of customer being discussed in this article includes, among others in the larger communities, the neighborhood grocer, druggist, baker, barber and beauty parlor operator, while in the smaller communities it includes all but the very largest of the stores. Broadly speaking, the small commercial group may be said to include all stores, shops and small industries establishments (such as small printing shops) of various kinds with connected loads of less than 10 kw. and using 1,000 kw.-hr. or less per month.

The Commonwealth Edison Company has long recognized the value of promotional work among its small commercial customers and has maintained four special sales divisions for these customers. These divisions are (1) *a commercial and industrial lighting division,* which sells, in addition to wiring and fixtures, midget heaters, ventilating fans, motor-driven equipment and all small electrical tools; (2) *a commercial refrigeration division,* selling self-contained commercial refrigerators, beer coolers, beverage coolers, water coolers and, for the past three years, room and store coolers; (3) *a commercial cooking division,* which sells commercial ranges, bake ovens and counter cooking devices, and (4) *an air conditioning division,* which offers engineering and cost information on all forms of air-conditioning equipment.

The officials of the company are thoroughly convinced that such activities are necessary and profitable. (For example, the estimated annual revenue per kilowatt of commercial refrigeration is $110 and per kilowatt of lighting is $50.) While the store equipment houses stand ready to supply such customers with practically a complete store layout, they are not in a position to promote electrical equipment as intensively as is the utility. Experience indicates that the utility is the party that has to sell the idea of using electrical equipment originally, then, after the demand has been created, the fixture houses will follow along.

Trial Installations

It has been found that free trial installations on certain types of lighting equipment and counter appliance equipment are very effective promotional aids. Wherever the type of equipment lends itself to it, demonstrations in the customer's own store are preferable to outside demonstrations, as it helps the customer to visualize the use of the equipment in his own establishment. One of the handicaps encountered in increasing the sale of electrical counter cooking equipment has been the cost of additional wiring, which is almost invariably required. Several utilities have found it to their advantage to make wiring allowances of from $4 to $6 per kilowatt installed to promote this type of business and to offer deferred payment plans.

In the fall of 1937 it was decided to make a market survey of the small commercial customers in areas outside of the central business district of Chicago. The figures given in the accompanying table are the result of this survey.

Load Survey of Commercial Customers

Connected Load and Electric Service Usage Characteristics — Small Stores and Shops

Type of Customer	—Connected Load— Aver. Lighting Wattage	Aver. Heating Appl. Wattage	Aver. Motor & Misc. Appl. Wattages	Total Connected Load	Aver. Kw.-Hr. per Mo.	Kw.-Hr. of Lighting per Cent	Kw.-Hr. of Appl. per Cent	*Aver. Hrs. Use per Day per Cent
A. Food								
1. Bakery	1,211	40	1,178	2,429	393.8	68	32	6.4
2. Confectionery	1,102	488	543	2,133	494.9	50	50	9.1
3. Dairy	514	53	243	810	210.3	68	32	10.4
4. Delicatessen	920	255	562	1,739	402.6	61	39	9.27
5. Drug store	2,542	1,264	534	4,340	1073.1	63	37	9.9
6. Fish market	2,238	17	95	2,350	118.2	89	11	2.01
7. Groceries	1,342	64	586	1,992	352.7	34	66	7.07
8. Meat market	1,701	13	1,592	3,306	500.1	42	58	6.05
9. Restaurant	1,099	795	539	2,433	772.3	57	43	12.7
10. Tavern	802	152	353	1,307	433.2	75	25	13.3
Average for group	1,277	512	569	2,358	475.1	60.7	39.3	8.45
B. Clothing and Dry Goods								
11. Clothing stores	5,121	172	274	5,567	759.2	94	6	5.45
12. Dress shops	3,505	391	95	3,991	537.2	95	5	5.36
13. Dry goods stores	2,519	245	94	2,858	375.7	94	6	5.25
14. Furrier	2,025	298	128	2,451	284.5	91	9	4.65
15. Hatter	1,074	396	150	1,619	294.6	88	12	7.3
16. Millinery	3,940	181	42	4,163	462.8	97	3	4.45
17. Shoe store	3,252	16	159	3,427	595.0	94.9	5.1	4.6
Average for group	3,387	255	132	3,774	472.7	93.4	6.6	5.29
C. Household Appliance—Automobile								
18. Auto supplies	3,398	211	613	4,222	434.4	79	21	4.11
19. Electric appliances	1,250	107	12	1,369	109.7	96	4	3.21
20. Furniture stores	6,303	119	147	6,569	382.3	98	2	2.33
21. Garages	3,546	557	730	4,833	801.0	81	19	6.57
22. Gas service station	2,238	274	1,539	4,051	392.3	35	65	3.88
23. Hardware stores	1,710	53	100	1,863	206.5	95	5	4.43
24. Plumbing shops	871	74	42	987	82.7	86	14	.33
25. Radio stores	1,877	23	120	2,020	311.5	96	4	6.16
26. Rug—Linoleum	2,122	...	133	2,255	374.6	80	20	6.65
27. Shades	575	102	11	689	68.8	88	12	4.0
28. Upholsterers	1,786	380	338	2,504	92.7	43	57	1.48
Average for group	2,867	176	444	3,487	296.0	79.7	20.3	3.92
D. Health and Office								
29. Doctors and dentists	644	862	209	1,715	106.5	55	45	2.48
30. Offices, miscellaneous	989	...	121	1,110	119.3	95	5	4.31
31. Opticians	1,586	...	133	1,719	183.8	96	4	4.28
32. Realtors	1,606	10	90	1,706	135.3	92	8	6.16
Average for group	1,297	134	111	1,542	136.2	84.5	15.5	4.31
E. Personal Service								
33. Barbers	596	104	220	919	103.4	82	18	4.5
34. Beauty shops	1,158	2,086	222	3,466	221.1	25	75	2.55
35. Cleaners and dyers	1,270	629	303	2,202	248.7	72	28	4.5
36. Laundries, hand	1,268	406	1,064	2,738	273.3	64	36	4.0
37. Shoe repair and valet	787	184	887	1,858	237.0	42.2	57.6	5.1
38. Tailors	1,266	135	624	2,025	150.5	74	26	2.97
Average for group	964	382	583	1,929	205.7	59.9	40.1	3.95
F. Luxury								
39. Cigar stores	1,950	83	261	2,294	360.7	83	17	6.3
40. Florists	2,195	37	158	2,390	287.2	88	12	4.7
41. Jewelry	2,777	60	173	3,010	436.3	97	3	5.79
42. Leather stores	1,364	...	377	1,741	135.4	62	38	3.11
43. Liquor stores	3,386	14	498	3,898	935.1	89.0	11.0	9.61
44. Pet shops	656	88	52	796	114.0	90.0	10	5.71
Average for group	2,572	41	301	2,914	378.1	84.8	15.2	5.87
G. Miscellaneous								
45. Magazine and news shops	583	41	276	900	414.1	87	13	18.4
46. Billiard and pool	1,290	...	233	1,523	437.3	92	8	11.5
47. Printing	196	...	1,282	1,478	141.3	28	72	3.83
48. School supplies	1,020	116	65	1,201	169.0	92	8	5.63
49. Shops, miscellaneous	2,269	170	161	2,600	227.1	87	13	3.5
50. Stores, miscellaneous	902	152	250	1,304	241.4	78	22	7.4
51. Undertakers	1,483	72	381	1,936	231.3	85	15	4.77
52. Variety	1,242	149	52	1,443	189.7	72	28	5.25
Average for group	1,129	126	218	1,473	256.4	77.6	22.4	7.53
Average for all stores and shops	2,046	418	506	2,970	331.7	76.0	24.0	5.55

* Average hours use of connected load per day based on 25-day month.

Many interesting facts were brought out by the survey, but for present purposes the most interesting fact developed is that the "average small commercial customer" is even more of a myth than the "average" domestic customer. Each of the first six groups listed in the accompanying table have well-defined characteristics, electrically speaking, and there is even considerable variation within the various types of business included in a single group. The first group can be called the "refrigeration" group and the "commercial cooking" group. The second group has the electric flatiron, or pressing equipment, as its common denominator, and, also, is becoming much interested in store coolers. The third group is the "tool" group. The fourth group is primarily a lighting group, although doctors, dentists and opticians use certain health and professional equipment. The personal service group is predominantly a lighting group, but also is a good market for electrical heating equipment, other than cooking equipment. The luxury group goes in most heavily for illuminated show and wall cases and should be a good market for air-conditioning equipment. Among commercial customers some form of fan, either ventilating, exhaust or breeze, is the common denominator among electrical appliances, occupying in this respect the same position as the flatiron among domestic customers. Radio is also found scattered among all groups.

Customer Differences

This survey showed conclusively that there is no more similarity, from an electrical point of view, between a restaurant, for instance, and a plumbing shop than between either of these and a domestic customer. This situation suggests that in approaching the problem of building a sales organization to that at present used by the Commonwealth Edison Company—*i.e.*, equipment specialization—could be to specialize and train salesmen to handle the electrical needs of various types of customers; that is, have one or more salesmen specializing on food store equipment including lighting, another on clothing and dry goods stores, and so on. This form of organization should be particularly effective where the number of cus-

[*Continued from page 109*]

Operating Record Proves Value of Limiters

Proper sequence of operation of limiters on secondary distribution networks, anticipated in design, are realized in practice, as demonstrated by tabular summary of 63 faults

C. P. XENIS *and* E. WILLIAMS, *Consolidated Edison Company of New York, Inc.*

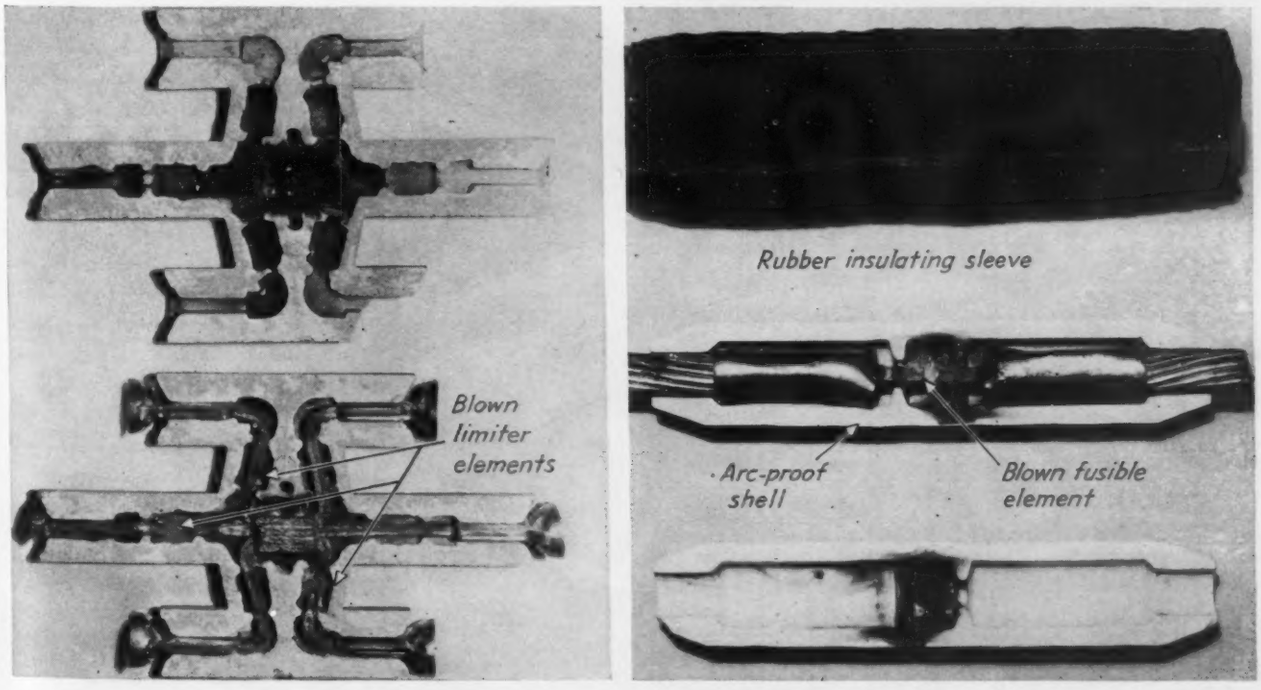
THE proper sequence of the operation of limiters with respect to the other related devices on the system, anticipated on the basis of design characteristics, has been realized in practice, as indicated by the fact that no limiters have blown during any secondary network failure except those on either side of a faulted section.

In addition, no network protector fuses have been blown in connection with secondary faults where limiter protection has been provided. Furthermore, in only one case have limiters blown in connection with a high-tension feeder failure where a defective network protector failed to operate on "back feed." In this one case proper selectivity was not obtained because the defective network protector was equipped with the incorrect type of network fuses.

In all cases where limiters were installed and a fault occurred the insulation of the cable on both sides of the fault was found to be in good condition. Furthermore, all faults were confined to that section of the cable in which they originated.

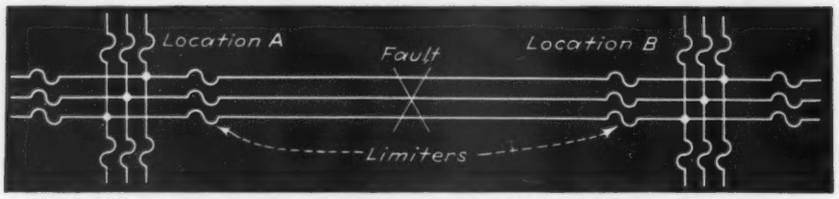
A review of the 63 faults, listed in the accompanying table, which occurred on cable sections completely or partially protected by limiters reveals that in 28 cases the faults burned clear before any of the limiters on either side of the fault could operate. These were cases which are considered as self-clearing types of faults.

In 23 other cases the faults were cleared by limiter operation alone or by limiter operation combined with burning clear of some of the faulted cables. In these cases the evidence indicated that the limiters cleared the fault on those cables mainly involved. The remaining cables either burned clear or were not involved in the fault. It is apparent that had limiter protection not been provided



No. 4/0 limiter blown in service (right) and 500,000-circ.mil, three-way; three-way fusible crab joint with three fusible elements blown in service (left). In all of the 63 failures — involving a total of 100 limiters — the limiters confined the faults to the cable section where they originated. In addition, no visible damage was caused to the insulation applied over the arc-proofing shells of the limiters

these faults would have been sustained for longer periods of time and the cables supplying the short-circuit current would, in many cases, have been so severely roasted that the trouble would have spread.



In only five cases where complete limiter protection was provided was it necessary to cut cables in order to clear completely the faulted circuits. In all of these cases the short-circuit current available was not sufficient to blow all of the limiters. In seven additional cases it was necessary to cut cables in order to clear faults

[*Continued on page* 111]

Limiter Operation on Secondary Network Mains Cable Faults

Case No.	Fault Caused by	Number of Limiters at Location A Installed	Location A Blown	Location B Installed	Location B Blown	Fault Cleared by Location A	Fault Cleared by Location B	Cable Damaged Ckt. Ft.	Remarks
1.	Steam shovel	6	0	6	0	Self	Cutting	19	Fault current below fusing range.
2.	Bullpoint	3	1	2	2	Limiters and self	Limiters and self	8	Limiter installation not completed at location B.
3.	Bullpoint	6	0	3	0	Self	Self	0	Slight arcing fault.
4.	Wear at duct edge	2	1	0	0	Limiters and self	Self	1	D. C. network.
5.	Bullpoint	6	6	6	3	Limiters	Limiters and self	2	Fault found on inspection three days after it occurred
6.	Bullpoint	1	1	1	0	Limiters	Self	0	D. C. network, one conductor faulted.
7.	Insulation failure	2	1	2	0	Limiters and self	Self	2	D. C. network.
8.	Insulation failure	4	0	0	0	Self	Self	4	D. C. network.
9.	Insulation failure	3	3	3	2	Limiters	Limiters and self	1	.....
10.	Wear at duct edge	6	6	6	2	Limiters	Limiters and self	12	.....
11.	Insulation failure	4	1	...	...	Limiters and cutting	.....	2	Protection of spur. Fault current below fusing range on last two phases.
12.	Joint failure	4	0	...	...	Self	.....	0	D. C. network.
13.	Bullpoint	2	2	4	3	Limiters	Limiters	5	D. C. network.
14.	Bullpoint	2	2	2	1	Limiters	Limiters and self	2	D. C. network.
15.	Joint failure	3	0	...	...	Self	.....	0	D. C. network.
16.	Overload*	2	2	...	...	Limiters	.....	0	D. C. service cables protected by limiters.
17.	Insulation failure	2	1	0	0	Limiters and self	Self	26†	D. C. network.
18.	Insulation failure	1	0	1	0	Self	Self	3	D. C. network, one conductor faulted.
19.	Overload*	4	4	...	...	Limiters	.....	0	D. C. service cables protected by limiters.
20.	Steam shovel	2	2	2	0	Limiters	Self	2	D. C. network.
21.	Wear at duct edge	2	0	0	0	Self	Cutting	20†	D. C. network.
22.	Bullpoint	5	3	5	0	Limiters and self	Cutting	8	A. C. and D. C. cables in same duct, arcing fault, current at B below fusing range.
23.	Insulation failure	3	3	0	0	Limiters	Cutting	20†	.....
24.	Insulation failure	3	2	3	1	Limiters and self	Limiters and cutting	10	Cut at B before all limiters operated.
25.	Bullpoint	6	4	6	1	Limiters and self	Limiters and self	3	A. C. and D. C. cables in same duct.
26	Joint failure	2	0	...	...	Self	.....	0	.....
27.	Wear at duct edge	1	0	0	0	Self	Cutting	0.5	D. C. network, one conductor faulted.
28.	Insulation failure	2	0	0	0	Self	Self	3	D. C. network.
29.	Bullpoint	6	6	6	5	Limiters	Limiters and self	15	.....
30.	External fire	27	8	19	2	Limiters and self	Limiters and self	See remarks	External fire destroyed all high-tension and low-tension cables and joints in temporary manhole. Cables faulted by fire either burned clear or were cleared by limiter operation in adjacent manholes. Subsequently all secondary cables were cut.
31.	Wear at duct edge	2	0	2	0	Cutting	Cutting	1	D. C. network, fault current below fusing range.
32.	Wear at duct edge	2	0	0	0	Self	Self	1	D. C. network.
33.	Wear at duct edge	2	0	0	0	Self	Self	1	D. C. network.
34.	Wear at duct coupling	2	0	2	0	Self	Self	1	D. C. network.
35.	Insulation failure	2	1	2	0	Limiters and self	Self	8	D. C. network.
36.	Insulation failure	1	0	0	0	Self	Self	0	D. C. network, one conductor faulted.
37.	Joint failure	3	0	...	...	Self	.....	0	D. C. network.
38.	Wear at duct edge	2	0	0	0	Self	Self	0.5	D. C. network, arcing fault, current below fusing range.
39.	Wear at duct edge	1	0	1	0	Self	Self	2	One conductor faulted, arcing fault, current below fusing range.
40.	Insulation failure	1	0	...	...	Self	.....	2	Protection of spur, one conductor faulted.
41.	Insulation failure	2	2	2	2	Limiters	Limiters	2	D. C. network.
42.	Wear at duct edge	1	0	1	0	Self	Self	1	One conductor faulted.
43.	Joint failure	5	0	...	...	Cutting	.....	3	D. C. network.
44.	Insulation failure	3	0	0	0	Self	Self	2	.....
45.	Bullpoint	1	0	0	0	Self	Self	0.5	D. C. network, one conductor faulted
46.	Insulation failure	2	2	0	0	Limiters	Cutting	Not available	D. C. network.
47.	Wear at duct edge	2	0	0	0	Self	Self	1	D. C. network.
48.	Bullpoint	6	0	6	0	Self	Self	1	A. C. and D. C. cables in same duct.
49.	Bullpoint	1	0	1	0	Self	Self	1	One conductor faulted.
50.	Bullpoint	2	0	2	0	Self	Self	1	Two conductors faulted.
51.	Insulation failure	2	2	2	1	Limiters	Limiters and self	1	D. C. network.
52.	Joint failure	3	0	...	...	Self	.....	0	D. C. network.
53.	Wear at duct edge	1	1	1	0	Limiters	Self	1	D. C. network, one conductor faulted.
54.	Wear at duct edge	2	0	2	0	Self	Self	2	D. C. network.
55.	Insulation failure	2	0	0	0	Self	Self	2	D. C. network.
56.	Bullpoint	6	1	6	0	Limiters and self	Self	2	.....
57.	Overload*	2	1	...	...	Limiter	.....	0	D. C. network.
58.	Insulation failure	5	4	0	0	Limiters and self	Cutting	20†	A. C. and D. C. cables in same duct.
59.	Insulation failure	1	0	0	0	Self	Self	0.5	D. C. network, one conductor faulted.
60.	Bullpoint	1	0	3	0	Self	Self	1	One conductor faulted.
61.	Insulation failure	2	2	0	0	Limiters	Self	2	D. C. network.
62.	Wear at duct edge	2	0	0	0	Cutting	Cutting	4.5	D. C. network, fault current below fusing range.
63.	Wear at duct edge	2	0	2	0	Self	Self	1	D. C. network.

* No fault. † Cable damaged on side unprotected by limiters.

What Kind of Man Makes the Best Local Manager?

Friendliness, self-reliance, good citizenship and all-around knowledge of the electric utility business are primary requisites that a man must have for successful handling of the local manager's job

JAMES HILL, ***President Arkansas-Missouri Power Corporation, Blytheville, Ark.***

AMERICAN public opinion, habits and trends are formulated on that of the small town of 25,000 and less; the town with a courthouse in the center square, business district folded around it; the town with two and not more than four trains per day, whose people come down and get their mail and tell about Aunt Sue's cake baking and Uncle John's intemperance; the town of Sinclair Lewis's "Main Street." This is the kind of town that Mr. Gallup samples to find out about American thought, because there are more of such towns and because the citizens of these towns have time to do their own thinking.

An All-Around Expert

In order to maintain low rates and furnish adequate service, the electric utility cannot afford elaborate offices with an expert for every purpose in towns of this class. It is necessary to have one or more employees with a good general knowledge of all the phases of the business. The man responsible for everything, and he should be held so, is usually referred to as the local manager. To the customer, he is the company.

The job is of such importance that every care and consideration should be given to the fitness of the man before he is assigned to the position. The customer and sometimes the company require that he be a composite of all the characteristics we expect to find in the near-perfect human being; in other words, he should be a superman. The best candidates for a local manager job are employees of years standing with the company, who are thoroughly acquainted with the management's policies and who have the best knowledge of operating problems. Promotions from within the company improve morale and place something before the office boy, the lineman's helper, and others, at which to shoot. Choosing men from other organizations to fill key jobs, like local managerships, should be the very last resort.

If executives who are responsible for personnel will review the list of key men—the men whose judgment can be trusted, men who will do the right thing at the right time without being told, men who have, as Napoleon said, "a 3 o'clock in the morning mind"—it will be found that the majority of them were originally from the farm. This statement is made with due respect to all who were reared in cities, but who have missed the opportunity to obtain training in the natural things of life that give a man so much knowledge. These farm boys usually come from large families with meager incomes and, therefore, have learned frugality. They have had all the excess ego worked out of them, for in working from "kin to can't" there is no time to meditate on what a big shot you are. They know how to give and take and are adaptable for fitting into an organization. They are resourceful and know how to use hay wire to keep things going when nothing else is available. They usually have good physiques, know hard work and are not clock watchers, unless it be the alarm part of the clock.

Friend to Everybody

The outstanding requirement of a local manager should be his ability to get along with people. When Andrew Carnegie chose Charley Schwab as his right-hand man in the steel industry he stated that there were many men who knew more about making steel than did Charley, but none in his opinion could surpass Charley in his ability to work with his fellowmen and get them to follow wherever he might lead.

The local manager should be temperate in his habits, yet not be a fanatic. He should know the ministers and leaders in his community as well as the gamblers and tavernkeepers, and he should be friendly and businesslike with all, yet not too familiar with any. He should be the type that is welcomed into all social and luncheon clubs and be able to speak in public. He should have a wife who can participate with him in all local social activities.

An Active Citizen

The manager should be on familiar terms with his Mayor and councilmen and be welcomed at all council meetings, in order that he may learn and take an interest in the development of his town and community. He should be the leader in his town in charitable, church, club and other community work which all good citizens are called upon to do. Boy scout and girl scout work is needed in all towns and it is especially suggested, because when you make a friend of the child by helping him to good citizenship, it naturally follows that the parents will appreciate your interest in him.

All complaints made to executives or heads of departments by customers should be handled through and by the local manager. The local manager is the company to the customer and he should be respected and supported in this position by others in all dealings with the customer. The

[*Continued on page 112*]

42,000 Attended the First Year

Ipalco Hall, an experiment in good public and employee relations, brings Indianapolis utility and its employees closer together

The good neighbor, Ipalco Hall (left), evolved from the eyesore on the right. A two-story structure 70x144x30 ft., with a main auditorium 70x80 ft.

ACTING on the theory that good public relations depend as much on being a good neighbor, a good citizen and an employer of good citizens as anything else, the Indianapolis Power & Light Company remodeled an abandoned steam heat plant which was something of an eyesore in a business zone of the north side residential district and dedicated it to the use of its employees on December 16, 1937, as Ipalco Hall.

This employee hall in its first year accomplished three things: First, it improved the neighborhood, and this alone meant better equity values for customers owning property in the vicinity.

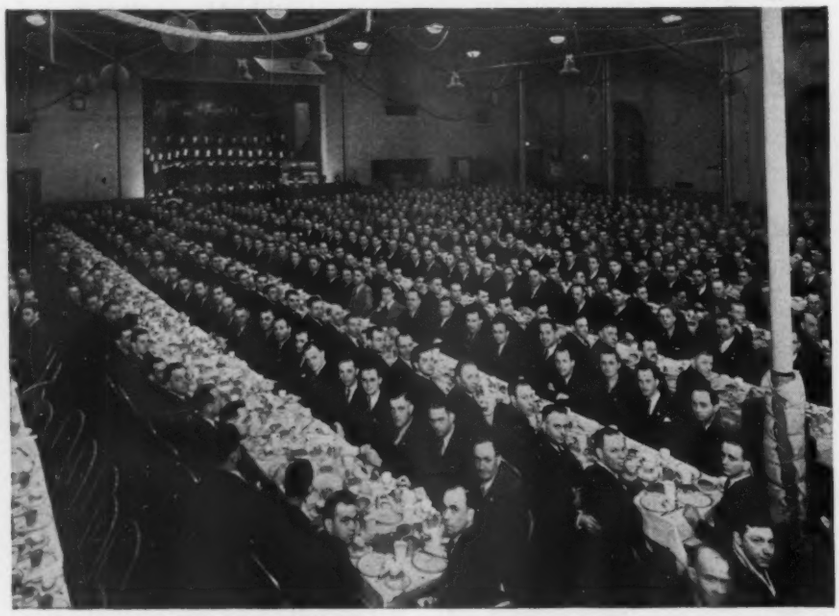
Second, it made possible the expansion of the company's personnel program to a larger degree than ever before.

Third, it built up an improved employee morale. During the first year an employee educational, recreational and social program brought 42,000 persons to Ipalco Hall during the ten months it was open; it is closed during the two summer months. Although the hall, or employee center as it is usually called, was used mostly for athletics, a wide range of other company and non-company events took place there. These included:

(a) Meetings of:

1. Ipalco Men's club.
2. Ipalco Women's club.
3. Ipalco Chorus.
4. Ipalco Band.
5. Company's American Legion Post and Auxiliary.
6. Young Men's Utility Forum.
7. Credit Union.
8. Superintendents' and Foremen's Safety Club.
9. Employee Activities Committee.
10. Mutual Relief and Auxiliary.

(b) Entertainments, dances, teas, bridge parties, Christmas club parties.



The auditorium with cooking facilities (electric) adequate to serve nearly 1,000 guests at a time and seating 1,500 comfortably. There were 863 at the 1938 Ipalco Club Christmas dinner party shown above

PUBLIC RELATIONS SERIES

(c) An educational program, carried on by employee groups.

(d) Trade, technical and scientific organizations of interest to or participated in by employees of the company, including:

1. Better Light-Better Sight local groups.
2. Better Vision Institute committees.
3. Electric League of Indianapolis committees.
4. Polaroid lecture open to general public.
5. Scientech club.
6. Indiana Electric Association.
7. State conference of Young Men's Utility Forum.

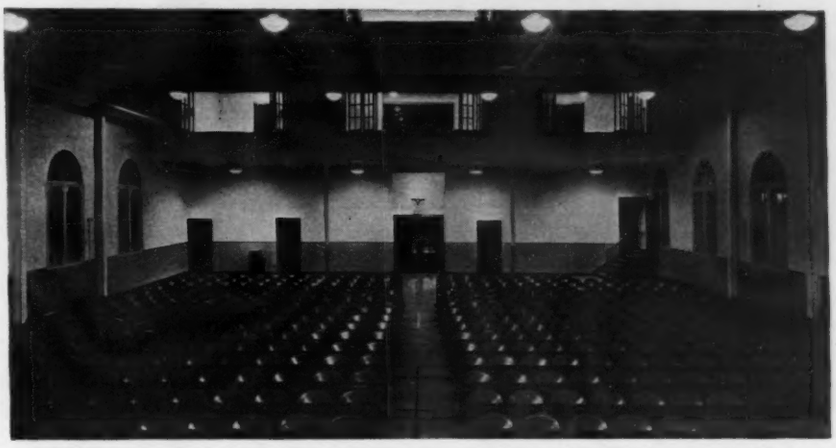
(e) Civic groups.

An employees' committee sets up rules for use of the hall. The company's vice-president in charge of personnel and public relations is the permanent chairman, and the personnel supervisor is the permanent secretary. Employee representatives chosen each year from the plants, downtown offices, service headquarters and the women's club serve on this committee. A full-time supervisor lives in an apartment adjoining the hall. Employees' pride in the building was reflected in the care they gave it while making full use of its facilities in a busy first year of activities.

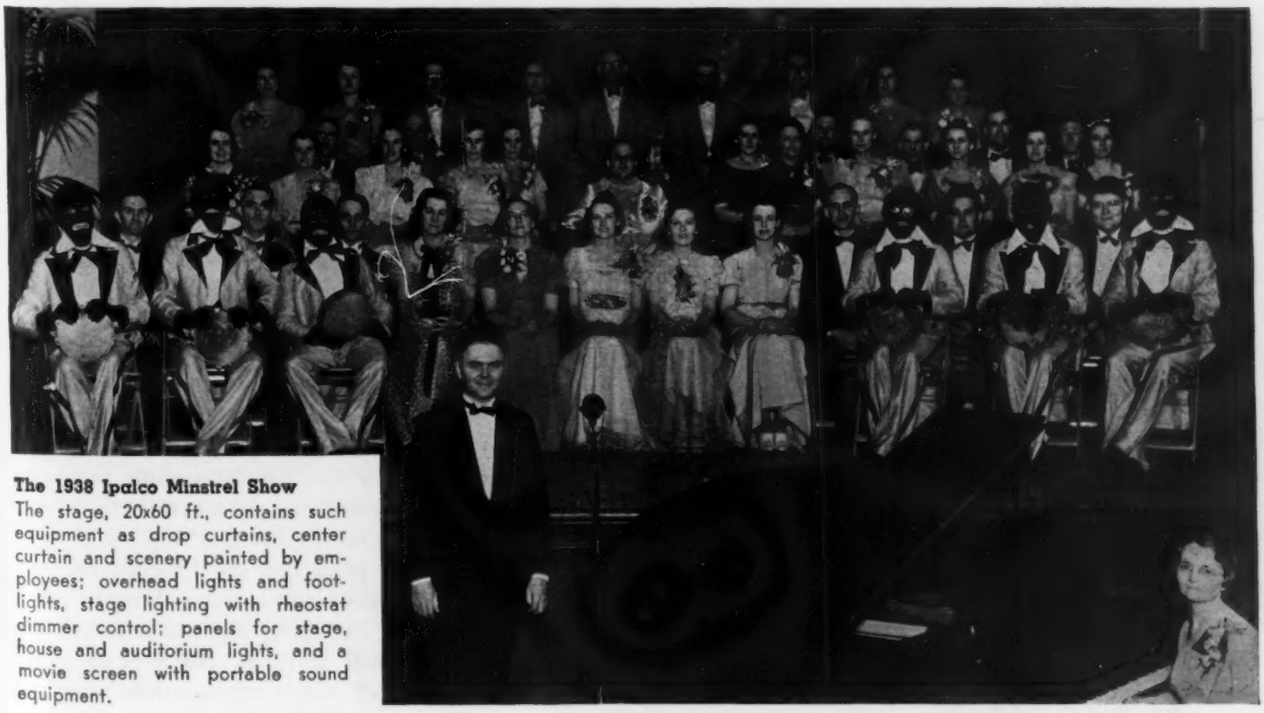
Employee refreshment funds (maintained through profits in the operation of candy, soft-drink and cigarette vending machines at the hall) have paid the cost of running much of the employees' athletic and recreation program, meeting the expense of basketballs, ping-pong equipment, prizes, etc.

The auditorium is also used as a gymnasium, being equipped for athletics of almost every description

This shows the girls' gym class. Shower and locker facilities, with rubdown equipment for both men and women, are available in different sections of a completely finished basement. The basement also contains a billiard room.



A balcony extending 12 ft. over one end is partitioned into one large room 28x44 ft. and a lounge 28x16 ft., equipped with radio, piano, card tables, books and facilities for table games. These rooms can be partitioned off for small meetings



The 1938 Ipalco Minstrel Show

The stage, 20x60 ft., contains such equipment as drop curtains, center curtain and scenery painted by employees; overhead lights and footlights, stage lighting with rheostat dimmer control; panels for stage, house and auditorium lights, and a movie screen with portable sound equipment.

Editorials

S. B. WILLIAMS, *Editor*

Congratulations, Alabama and Georgia

AMONG the good news of recent weeks nothing stands out stronger than the announcements of capacity expansion in Alabama and Georgia—40,000 kw. for the former and 35,000 kw. for the latter. As soon as the threat of TVA competition was removed the two companies serving the major part of these two states felt free once more to add to capacity.

Not only will the companies benefit but the communities they serve as well. These additions will mean the expenditure of millions of dollars for labor and materials in the two states. They will enable the companies to make greater efforts to attract new industries to their territories and so improve the local economy. They will give the companies added incentive in load-building activities. They will provide more jobs in the companies themselves. They will give to employees of the two companies a greater sense of security and opportunity. And, incidentally, they will add materially to the tax receipts of the communities served.

And all this and more could have been had earlier, not only in the Southeast but elsewhere, if the blight of government competition had been removed.

What Does It Cost to Serve Load Classes?

SEVERAL utilities were recently asked by a sales executive for data showing the cost to serve different types of load. The information wasn't available.

Is this situation true generally? And if it is, how can sales managers be sure that the loads they select to promote are the most productive of net revenue? How can they be sure that all the loads they are pushing are net producers?

Obviously if selective selling means anything, it means promoting loads that will improve the net. It would almost seem axiomatic that the determination of which loads to promote, and where, could be more positively determined if the cost to serve individual loads were known.

A Different Interpretation of I.B.E.W. Employment Data

JOB OPPORTUNITIES for members of the I.B.E.W. took a tumble in 1938, according to the September issue of its official organ, *The Journal of Electrical Workers and Operators.* The conclusion reached by the Brotherhood's research department was that mechanization is responsible for employment reduction. We think that there are other contributing causes which the Brotherhood can remedy if it will.

The data cover the period from 1931 through 1938 and show that inside members, that is, men employed in the construction industry, had a percentage of full-time employment last year of 61.1 per cent. In 1931 it was 42.7 per cent. The peak was 72.4 per cent in 1937.

Since the Federal Reserve Board's index of the volume of construction was but 59 in 1937 against 64 last year, it is argued the "industry is slowly breaking down its resistance to mechanization." That may be true, but it must be observed that index for 1931 was 63, yet employment of construction wiremen was off by nearly a third from last year.

While undoubtedly mechanization is increasing, especially in large construction, these figures seem to prove that perhaps the character of construction projects has more to do with the volume of employment.

However, the figures also show that electric utility members had a peak employment in 1931 of 96.3 per cent of full time, only to fall off during the worst of the depression. It came back to 94.9 per cent in 1936 and last year was down to 82.2 per cent. Even so, it was a full 33 per cent better than the record last year for the construction men.

Output of the utility industry was shown to be down last year 5 per cent, while utility employees were less by only 2.8 per cent. Full-time employment per utility worker, however, was down 10.7 per cent, indicating fewer hours and greater spread of work. That seems to be a pretty good record for an industry which the I.B.E.W. through its *Journal* has lambasted whenever it could.

But to go further, the Brotherhood states that the loss last year in utility output of 5 per cent was offset "through increased charges for service" sufficient to bring the revenue for the year to within one-half of one per cent of that for 1937. The record of the industry as printed by the Federal Power Commission shows, of course, that the statement is not true. There were no increased charges for energy. The revenue did not fall off more, simply because the utility industry sold more energy to the domestic and commercial groups, while the larger-use low rate industrial group was using less. Instead of increasing charges, the rates to the two groups that used more energy last year were reduced.

And there is the point that the I.B.E.W. has persistently refused to acknowledge. The utilities by creating a market through the homes and stores is building an opportunity for inside wiremen. But does the union try to help the utilities? No, it opposes them in almost

every effort to enlarge this market and is doing so right now.

The Brotherhood's *Journal* states in its conclusion that either "new and substantial fields of employment must be opened up" or hours have to be shortened. Well, what is to prevent new fields for employment being opened up for inside wiremen? Certainly the Brotherhood isn't helping matters any by opposing the suggestions of the utility industry. Most of the E.E.I. suggestions for Code changes would pass the N.F.P.A. Electrical Committee were it not for the active opposition of organized labor.

The only reason there has been such a fine employment record among utility workers is that the utilities have promoted the home and commercial markets. In both of these markets wiring is a bottleneck. If the cost of rewiring could be reduced, there would be an offsetting employment far in excess of the percentage of unit labor reduction.

It seems to us that the Brotherhood has an equal interest in this bottleneck with the utilities. It seems to us that instead of taking every opportunity to attack the utilities, labor would be much better off looking for ways to co-operate—that is, provided its real interest really lies in wanting to improve the degree of employment of its members.

The shorter work week merely stimulates mechanization to new efforts. The only winning way is producing more. A little acknowledgment of mutuality of interest might do the trick.

600-Watt Farm Service

SHARE CROPPERS and tenant farmers are now going to have electric service from REA lines. They can dig a service trench, install a $21 transformer, a $3.00 circuit breaker and an underground cable at 3 cents a foot for a total connection cost of about $35 instead of the customary $75 to $100. And REA can reduce the minimum charge to one dollar a month instead of the usual $2.50 to $3.00 or $4.00. This is the latest REA scheme to reduce costs, promote electric farm service and add customers to lines.

But this service has a capacity of only 600 watts. It will supply only a radio, an iron and one or two lights. If the farmer wishes to use more service the connection will have to be replaced. It will take a mighty good accountant to show that a reduction in connection cost of from $40 to $65 for a minimum-use customer permits of any profit on a minimum charge reduction of $1.50 or more a month.

REA is finding that universal electric service for farmers is an ideal that runs up against practical obstacles. Sooner or later it will find the answer to profitable farm service, if ever, lies in full use and not limited use of electric service. Can it be, however, that REA during these pre-political convention months is more concerned with increasing a number of radio-equipped farms than with building rural electrification on a sound basis?

Little Difference Between Historic Cost and Fair Value

A RECENT rate decision by the North Dakota Board of Railroad Commissioners (*re* Northern Power & Light Company) suggests once more the pointlessness, under present conditions, of the venerable historical-cost-versus-present-fair-value controversy. According to the well-established rule laid down by the United States Supreme Court forty-one years ago, a utility company is entitled to a fair return on the value of its property used and useful in the public service. But so-called liberals, both in and out of public office, have long waged bitter war against this rule. That their efforts have not been altogether in vain was indicated sensationally a few months ago by the announcement of the Rhode Island Division of Public Utilities (*re* Narragansett Electric Company) that "no specific method of determining a rate base has ever been adopted in this state. This division shall now approve the historical cost of prudent investment theory."

The North Dakota board, in the instant case, purports to follow the orthodox fair-value rule. We use the term "purports" advisedly, for in the light of rate reductions that utility commissions have ordered, sometimes in spite of rising values and increasing operating expenses, one may well suspect a tacit disregard of present value behind the lip service still paid to the established rule. At all events, the significant fact about the Northern Power & Light case—and an increasing number of rate cases throughout the country—is the trifling difference between the fair value and historical cost of the property involved; indeed, if the board had chosen to follow the historical-cost theory, the rate base would have been only about 2 per cent lower than the rate base actually determined by the board. In the Rhode Island case historical cost and cost of reproduction (less depreciation) were almost identical.

For present purposes, then, there may be little difference between the alternatives presented by the rate-base controversialists. But in the future the difference will not always be so minute, and it may therefore be necessary to adopt a critical approach to the controversy.

Nevertheless, the electric power industry has no immediate quarrel with advocates of the historical-cost theory, so long as that theory is intelligently applied. When, however, commissions tend, as did the Rhode Island Division of Public Utilities, to confuse historical cost with "prudent investment," the industry has every reason to protest. For prudence is a matter of individual opinion. One may well question whether a commission is justified in substituting its business judgment for that of a utility company's investors and officers, especially with regard to transactions made years ago under conditions which commissioners can now reconstruct only in imagination—transactions that they can review, however, with an *ex post facto* wisdom and hindsight born of a knowledge of interim events which the original parties could hardly be expected to have anticipated by any method short of economic clairvoyance.

The Spanking of Johnson

By CARTER FIELD

This noted journalist gives his personal comments and interpretations on current happenings affecting the electrical industry. His background and his location at Washington make his thoughts informative and interesting even though all may not agree with him

HAROLD ICKES is now the Grand Pooh Bah of the little government group which is to determine, in peace and in war, just what is needed in the way of electric energy by the government and the people of the United States. Honest Harold replaces Louis Johnson, Assistant Secretary of War, who had dared sanction a war resources board which worried only about war resources, and bothered not a whit about advancement of social objectives in the planning processes. Johnson is named one of this new group by President Roosevelt, but he is now a private in the rear ranks, not the chairman. Presumably the theory is that he has been so soundly spanked, and the reason for the spanking was made so unmistakably clear, that he may now be trusted in a minor position.

War Talk Hurt

It's really a wonder that Johnson was not thrown overboard altogether. He had been embarrassing to the Administration in another and more immediate way. For it is Johnson who is said to have frightened the pacifist elements in Congress into believing that the Roosevelt Administration was planning to put this country into the war on the side of Britain and France within six months. One wonders who Johnson could have been talking with to have gotten such notions! It happens there were activities far beyond Johnson's sphere. As when the President told newspaper correspondents he intended to increase the Marine Corps —which happens to be under the Navy Department—by 25,000 men. Or as when he told them about reconditioning the 116 destroyers. And as when the news of reconditioning the old Hog Island ships came from the Maritime Commission.

Actually, however, Johnson's belligerence in conversations was hurting the President's battle on Capitol Hill. It was giving ammunition to Senator Bennett Champ Clark and other pro-embargo solons, and thus delaying the supply of ammunition to Britain and France by postponing the vote on the repeal of the arms embargo.

But it is worth noting that there was no anger at the White House against Louis. He had made a bad mistake, on that war resources board, but this *might* have been an error of the head, not the heart. For who could blame an honest New Dealer for trusting Chairman Stettinius of the War Resources Board, when even Thurman Arnold had praised Stettinius as the right sort of capitalist?

It is interesting to note here that the whole picture, so far as the war is concerned, has changed since Johnson and other Administration lieutenants were so feverishly getting the U. S. ready to do its bit. Actually the decision was made by Hitler. For reasons which have been explained at length by the international experts, Hitler held back on major activities against both Britain and France. From the standpoint of guns and munitions and planes this has been of incalculable advantage to Britain, whose supplies of these, and of airplanes, were woefully short. Now, with winter setting in, it is believed unlikely that there can be heavy fighting on the western front before spring. Every passing day finds Britain a little better prepared, a little less vitally dependent on quick supplies from the United States.

By the same token every passing day puts off the day—if and when—the active participation of the U. S. might be necessary to save Britain and France. So the "six months" period so much in private conversation in Washington in early September has now changed. Now a lot more folks are actually hoping the U. S. will never get into it. Some are even beginning to believe we never will.

Sometimes the observer on the sidelines wonders if the British and French are being frank with our diplomats! Remember that recent conference of the Pan-American nations at Panama? Remember how the other nations wanted to postpone it, but we wouldn't? And remember how Sumner Welles, our astute Secretary of State, virtually ran that conference, finally getting approval for a 300-mile neutrality zone around the Americas?

But then what? Britain and France didn't see how this could be practical. How about Jamaica, and British and French Guiana, and British Honduras, and Martinique? So what? Don't write your congressman. He is too worried about the arms embargo to worry about what particular seas those reconditioned destroyers are going to patrol. Or what they will be looking for when they do.

The more one studies the situation the more apparent it is that Louis Johnson did not get out of step with the White House on the war preparations, and that his talking too much was the sort of mistake Roosevelt frequently forgives.

More Knuckle Cracking

But Harold Ickes, in charge of a survey of the electric resources of this country, both for peace and war, is not mysterious. It is as obvious as the ruler in the hands of an old-fashioned knuckle-cracking schoolmarm.

Ickes believes passionately in public ownership. He distrusts the honesty of every utility official in the country. In fact, he is sure of the complete honesty of only two people —himself and FDR. There used to be three, but that was before Hiram Johnson, who originally recommended him to Roosevelt, played into the hands of the reactionaries by opposing the President on the Supreme Court packing bill.

One thing is certain—there will be no report from this new group, which is to be dominated by Ickes, which will overlook the glorious opportunities which either peace or war emergencies will give to extending the beneficent influence of federally subsidized, publicly owned electric systems.

NEWS OF THE WEEK

Government Competition Still Threat to Utilities

Chairman Groesbeck tells Electric Bond & Share stockholders that many serious problems remain and international events may bring new ones — Cites new capacity to meet power loads

Stockholders of Electric Bond & Share Co. were told at their annual meeting last week in New York by Chairman C. E. Groesbeck that all of the problems of the company are not solved, although substantial improvements have been made in operations. "On the contrary," Mr. Groesbeck said, "many serious ones remain, and the repercussions from international events may bring new ones."

Uncertainties remain as to the future status and earnings under the Holding Company Act, Mr. Groesbeck declared, "and the problem of actual or potential government competition is still of major importance, although encouragement is to be derived from the progress made on our co-ordination program."

War Effect Uncertain

Mr. Groesbeck told the stockholders that the effect of the European conflict on the group of companies cannot be estimated. He pointed out that the power supply of the group has been augmented by more than 500,000 kw. in the last year. The construction of more than 39,000 miles of transmission and distribution lines in the last 6½ years has further strengthened its position.

"The personnel of the system—53,000 in number in the United States—is trained and seasoned," Mr. Groesbeck pointed out. "Many of them successfully operated utility properties during the difficult 1914–1918 period and are equipped by special experience to meet the unusual demands that might result from the present foreign conflict."

Mr. Groesbeck pointed to higher earnings and a new peak in power output for the system. He said that in the past twelve months the companies have completed the installation of 249,250 kw. of new generating capacity, with 137,500 kw. more authorized for immediate construction. Studies are being made to ascertain where further capacity might be required.

"The carrying forward of our co-ordination plan," Mr. Groesbeck said, "has made available to this system more than 155,000 kw. of capacity, in addition to the 386,750 kw. At the present time the total installed generating capacity amounts to approximately 4,540,000 kw."

Reviewing efforts of co-ordination of government and private utility facilities, Mr. Groesbeck said that such co-ordination would give protection to private investors; would make available, as uses of power increase, markets for the output of government plants without further competition with private industry, and would give the consumer the benefit of any savings in power costs.

"Today the progress we have made assumes greater significance," Mr. Groesbeck declared, "because while further physical interconnections may still be advantageous, means already have been afforded of getting to manufacturing and producing centers of the country, cheaply and quickly, a large additional amount of power from governments plants which may be useful in meeting any heavy demands resulting from the European war."

ANNUAL MEETING—A large number of stockholders of Electric Bond & Share heard Chairman C. E. Groesbeck (center) tell the annual meeting that all of the problems of the company are not solved and that conditions may bring new ones. S. R. Inch, president (left), and S. W. Murphy, vice-president (right)

Industry Encouragement Seen Need in Emergency

Efficient performance of business cannot be expected if theoristic reform is attempted at the same time, Desvernine tells A.I.E.E. meeting — Industry against war

Government owes as much in patriotic responsibility to business as business owes to government in the present and any possible future emergency, Raoul E. Desvernine, president Crucible Steel Co. of America, told electrical engineers assembled at the Middle Eastern District, A.I.E.E., meeting at Scranton, Pa., last week.

"Industrial preparedness necessarily implies that industry be given every opportunity to make itself an 'effective' in the national emergency," Mr. Desvernine declared. "There is no use talking about industrial preparedness and at the same time destroying or curbing industry's capacity to prepare. It takes a physically fit soldier to do a real job."

Business Against War

It is the most irrational and purely malicious accusation that could be made for any one to say that business men want war for commercial reasons, asserted Mr. Desvernine. Business men want peace, not alone for humanitarian reasons, but for purely commercial considerations as well. There is, and there can be, no profit in war. The last war conclusively demonstrated that. Only to read the balance sheet of the liquidation of the last war is to give the lie to the accusation that war is commercially profitable and beneficial.

Mercury arc rectifiers for supply of direct current to cutting and loading machines and to haulage equipment in coal mines have found increasing application in recent years, according to the paper presented by D. E. Renshaw (Westinghouse). In this field the Ignitron type of rectifier is finding conspicuous favor because of its better performance at low output voltages.

Discussing Mr. Renshaw's paper, F. L. Kaestle (General Electric) said that the high percentage of very light load periods in coal mining emphasizes the most outstanding advantage of the rectifier, that of low no load losses, which accounts for its high efficiency at light loads.

Standardization of protector tubes appears to be approaching crystallization, judging from the content and the discussion of the paper jointly prepared by H. A. Peterson and W. J. Rudge (General Electric) and A. C. Monteith and L. R. Ludwig (Westinghouse). Most significant feature of the paper was a comprehensive tabulation of "Recovery Voltage Characteristics for Which Proposed Standard Tubes Are Designed."

The third report on lightning investigation on the Wallenpaupack-Siegfried 220-kv. line was presented by Edgar Bell (Pennsylvania Power & Light). Methods of power supply for suburban areas employed by Philadelphia Electric were described in a paper by R. A. Hentz and J. A. Thielman of that company. An interesting feature of the paper was the comparison of bare and covered wire for primary lines based on experience in two experimental areas.

New developments in current transformer design were described by G. Camilli (General Electric) as of a construction in which the features of cable insulation had been adapted. This, in combination with the "Spirakore" development plus "cascading" a number of transformation elements resulted in a construction of about one-half of the weight and of the volume of previous designs. Discussing this paper, E. L. Harder (Westinghouse) drew attention to satisfactory performance of cascaded design in steady state operation, but pointed out that the value of a current transformer used for differential relay operation was of its operation during transient conditions when the cascade design might not be so good.

For those who wanted to know the whys and wherefores of the apparently late development in this country, as compared with Europe, of oilless circuit breakers, the talk by D. C. Prince (General Electric) and the remarks in discussion by R. E. Hellmund (Westinghouse) were most illuminating.

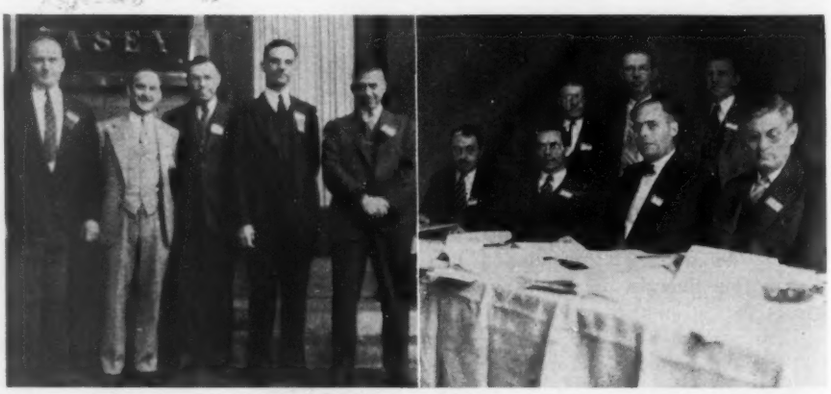
There is a considerable difference in the philosophy of circuit breaker ratings between European and American practice. Here the kva. rating is expected to hold within a wide range of voltage, whereas in Europe a breaker rated at, say, 15 kv., is expected to perform at that potential only, not to break twice the amperage at half the voltage.

Bushing Design Trends

A picture presentation of trends in high-voltage porcelain bushing development by T. F. Brandt (Ohio Brass) opened the last session of the convention. Next came a discussion of insulation power factor testing as applied to transformers by J. B. Hodtum (Allis-Chalmers). Experimental data indicate a definite relation between resistance and capacitance under varying conditions of temperature and moisture.

The ingenious electrical scheme of the three-phase commutator type variable-speed motor was explained in a paper by Howard M. Edmunds, Crocker-Wheeler. This motor employs an induction regulator for making a low-voltage connection between supply line and rotor brushes and has already found a variety of industrial applications, particularly in the printing and textile fields.

In the paper on the theory and design of NEMA resistors for motor starting and speed control by George C. Armstrong (Westinghouse) formulas are developed for a possible standard method of calculating the values of these resistors.



SCRANTON MEETING—At the Middle Eastern District A.I.E.E. meeting last week were: Right, the standards co-ordinating committee in session; seated—T. F. Brandt, Ohio Brass; P. L. Bellaschi, Westinghouse; E. J. Rutan, Consolidated Edison, and C. M. Foust, General Electric. Standing— W. W. Lewis, General Electric; P. H. McAuley, Westinghouse, and I. W. Gross, American Gas & Electric Service Corp. Left, l. to r.—J. W. Mills, Mills Electric; G. E. Northup, Scranton Electric; W. J. Lyman, Duquesne Light; E. F. DeTurk, Metroplitan Edison, and C. T. Sinclair, Duquesne Light

Effect of War on Electrical Industry

Survey by "Electrical World" among utilities, manufacturers and state regulatory commissions reveals present upturn in business largely due to improved domestic conditions, intensified somewhat by anticipation of war demands and inventory replenishment against possible price advances — Larger budgets for utility construction expected in 1940 — No abnormal price increases indicated — No effect on regulation anticipated.

Utilities

Utility executives are almost unanimous in declaring that improved volume of energy output is due very largely to normal conditions. Effect of war has been to stimulate certain kinds of industrial production, either in anticipation of future munitions orders or in anticipation of price advances in basic commodities. Improved output has been general throughout the country and appears to follow the trend of better business conditions. Probably less than 20 per cent of this increase can be attributed directly to conditions arising out of the war.

Because of increased output, construction budgets for next year are expected to be higher, ranging all the way up to 100 per cent and averaging in the neighborhood of 30 per cent.

To some extent, construction schedules have been advanced, sometimes as much as two years. In general, however, this is not the case. It is believed that the program indicated of increasing budgets will be ample to take care of growing demand of the present order. The estimated budget, therefore, for next year will be the largest of any year since 1930.

In general, utilities have not bought supplies heavily during the past two months, although there has been some replenishment of inventory and considerable hedging against possible price increases. This has been reflected considerably in copper.

A considerable volume of orders has been placed for new generating equipment. Many of these orders have been planned for some time, but have been released as soon as load conditions indicated the extent of probable new peaks. A number of other orders are expected to be placed before the end of the current year.

Where companies do not have their own mines or mouth-of-mine plants, coal supply in general runs at present from 60 to 90 days, so that there should be no immediate problem in that connection as there was during the World War.

Employment, other than some increase in construction forces, has not been affected by the present upturn. There has, however, been some increase due to the requirements of the Wages and Hours Act.

The upswing in output has had no effect upon plans for promotion or new business. Where new capacity has been added, it was indicated that more intensive sales activities would be in order.

Manufacturers

Bookings of electrical manufacturers have increased from 10 to more than 200 per cent. Not all manufacturers, however, have noticed such substantial increases. Some supplies, such as wire, appear to have had a sharper rise in volume than others. Average indicated appears to be around 35 per cent.

War conditions have been responsible for a substantial part of the increase, although the survey discloses that for the most part the improvement is due to normal domestic conditions. Probably less than 40 per cent of the increase on the average can be attributed to war conditions. That part of the increase traceable to war conditions is laid by most companies either to price hedging or to buying for projects brought to a decision by the war. The buying due to fear of price inflation appears to have been unnecessary, since the majority of manufacturers predict little or no increase in price, at least during the remainder of the year. The trend, however, is toward rising prices, but with every indication that there will be no runaway market.

Protection against price increases is being given for periods from 30 to 90 days. In general, long-term prices will not be quoted except on firm orders.

On the whole, manufacturers have maintained deliveries, although there are some indications of lengthening deliveries in the coming months. Except for possible shortage of steel and of skilled labor, no production bottlenecks are anticipated at the present time.

Manufacturers are not inclined to accept orders from foreign governments for war munitions. The policy will be to confine their operations to serving their regular business. A limited number of manufacturers indicated that where foreign orders can be made a part of regular production or will not disturb regular production they will be accepted.

Regulation

Public utility commissions were almost unanimous in the expressed belief that it is still too early to tell how the war might affect utility regulation. Consideration has been given to the problem, however, and a substantial majority of the commissions believe that any situations arising can be met adequately on the basis of the World War's experience.

In a few states emergency statutes on the books provide immediate relief for utilities facing rising cost possibilities. In most states formal application at least must precede rate changes. Little change is seen in financing operations of utilities arising from possible more costly money.

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Nevada-California Electric Wins Safety Council Award

For the second time in four years the first-place trophy for accident-free vehicle operation was awarded to Nevada-California Electric Corp. by the National Safety Council this week. This year's award in the national fleet safety contest was for the public utilities truck division. The award in 1935 was in the passenger car division.

Nevada-California's record was outstanding. In 1,188,000 miles of operation its fleet encountered but eight accidents, thus achieving a frequency of 0.67 per 100,000 miles. Average for the group was 2.55. The corporation's sixteenth-place showing in the category which won it a trophy four years ago was almost as imposing, with a frequency of 0.91 in 769,000 miles, as compared with a 1.51 group average.

J. S. Allan is safety supervisor for the Nevada-California Electric Corp., whose headquarters are at Riverside, Calif.

Art Advances Reported at E.E.I. Swampscott Meet

Circuit breakers, cable corrosion, transformer specifications and loading and gap performance occupy attention of engineers — Fault neutralizers and new devices discussed

Strong trend toward oilless breakers and marked progress in clarifying the permissible loading of transformers were high points in the concurrent sessions of the E.E.I. electrical equipment and transmission and distribution committees at Swampscott, Mass., last week.

A query on breakers brought forth unequivocal assertions from several prominent companies that they contemplated buying no more oil breakers for either distribution substations or station auxiliary circuits. H. S. Fitch (West Penn) said he was convinced when he saw a non-oil breaker in industrial service that had already undergone 45,000 operations and looked good for as many more—equivalent to several generations of utility service. This discussion occurred following Nicholas Stahl's (Allentown) review of the recent demonstrations of new General Electric breakers at Schenectady.

Transformer Analysis

In a highly commended paper H. P. Seelye and A. N. Pope of Detroit Edison presented (and presumably for the first time) a method of analysis which takes account of the effect of a whole year's operation on the life of a distribution transformer. Emphasis was upon maximum economic loading of a piece of equipment which typically represents 2.65 per cent of electric plant investment. They found that about 140 per cent of rated load on distribution transformers will permit a 25-year life for either residential or commercial area transformers despite the inherent differences in characteristic load cycles. This company therefore is cautiously raising the scheduled loading from the previous value of 120 per cent for radial units.

New Transformer

Commendable progress toward the prospect of a "1940 streamlined" distribution transformer was indicated by the report of the joint NEMA-EEI committee on specifications for interchangeable units designed for universal mounting. Merrill DeMerit (West Penn) reported on extensive computations intended to provide a basis for proportions of copper and iron losses better related to the changed conditions of energy cost, load factor and overloading trends.

Cable sheath corrosion was indicated to be looming as most important among unsolved cable problems and it was admitted that little progress is being made. One in five difficulties arise from this cause and 95 per cent of those are attributable to other than stray current causes, said A. S. Brookes (Newark) in commenting on E. R. Thomas' (Consolidated Edison) 1938 cable operating report. Some sentiment favored an inexpensive covering to protect the sheath.

D.c. transmission, said C. M. Gilt (Consolidated Edison), will undoubtedly remain in the experimental realm for small powers until some much cheaper terminal arrangement is devised.

F. A. Lane read the Sporn paper on Co-ordination of Equipment Ratings, which appeared in the October 7 ELECTRICAL WORLD. R. A. Hentz presented his Schuylkill Plant Modernization paper, which appeared in the September 23 issue.

Supplanting of non-migrating type 4,800-volt cable with high-temperature varnished- cambric whenever a head of more than 6 ft. exists was reported by G. B. McCabe (Detroit Edison). Conversely, T. J. Brosnan (Buffalo) reported a shift from varnished cable to paper and to corona-resisting rubber for pole risers, largely due to the uncertainties connected with varnished cable taping.

Five-sixths of the 1,603 calls made over Philadelphia Electric Company's emergency radio were said by H. L. Davis to have been satisfactory. Power has recently been raised to 250 watts to override high noise along heavy city traffic arteries.

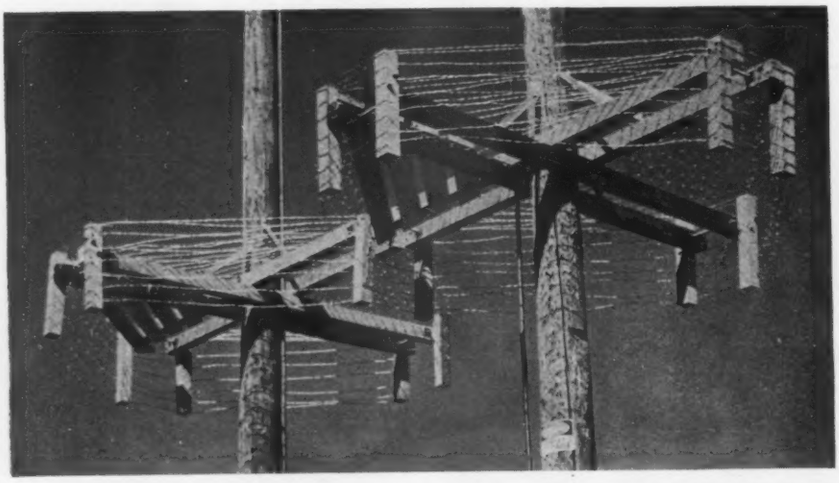
Reclamation of transformer oil at better than 8 cents per gallon was reported by R. G. Call (Beech Bottom Power Co.), and this was confirmed by West Penn experience of 6 cents, including transportation costs.

Advance in ascertaining delivered voltages is afforded by a new meter described by Stanley Stokes (Union Electric, St. Louis). It is a watt-hour meter arranged to integrate the squared voltage and record the maximum and minimum fifteen-minute intervals.

Double Spill Gaps

As for system equipment protective gaps most utilities, said D. M. MacGregor (Ebasco Services), are finding it desirable to go to double spill gaps on distribution transformers (particularly below 15 kv). Delaying of relay action to permit fuses to clear gap spillovers is being studied. Gaps have cut blowing of fuses and transformer damage where transformers were previously unprotected.

Meter manufacturers within six or eight months will be able to supply meters safeguarded against the adverse accuracy effects of lightning, said A. B. Craig (Boston Edison). These will have magnets of high coercive force or shielded with a 0.015 shell of copper plating. His meter committee report stated that three-wire meters now constitute 56 per cent and



ENTANGLEMENT—Public Service Co. of Colorado has again erected this barbed-wire entanglement on poles near the University of Denver football stadium as a safety precaution to prevent their use as grandstand seats

the 15-amp. size 54 per cent of the purchases.

Comprehensive treatment of ground fault neutralizers was presented by E. M. Hunter (General Electric). There are 7,000 miles of line now protected by 37 such Petersen coils and they are being cleared of a large percentage of faults, he asserted. H. J. Klumb (Rochester) was partial, however, toward a trip-free mechanism and reclosure to clear faults and said he was considering the use of three-shot reclosing fuses in the neutral to perform a comparable function. R. N. Conwell (Newark) warned that Petersen coils are no panacea and reported good results on 30 miles of 26-kv. line (80.3 per cent reduction in outages) by using the top phase wire as a ground wire for surges through an expulsion gap associated with a down lead.

New Douglas fir crossarm specifications prepared by L. G. Smith's (Baltimore) committee were approved for circulation as letter ballot after further minor revisions.

A new line of air-blast breakers was announced by Allis-Chalmers. Burndy exhibited a new 9-ton foot-operated hydraulic press for conductor splicing and terminations to be available in a few weeks.

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Pennsylvania Utility to Spend $3,000,000

Pennsylvania Power & Light Co. plans to spend $3,000,000 for plant additions at Harrisburg and to increase capacity by 20,000 kw. Expansion plans were drafted in co-operation with the National Defense Power Committee and "in accordance with a request of the state Department of Commerce that electric utilities be prepared to handle the demand due to Pennsylvania's industrial expansion."

The expansion of the Cedar steam-electric station in South Harrisburg is to be ready for service in the summer of 1941. It is estimated that the work will provide employment for 250 to 350 men.

Officials of the company state that preliminary construction work will be under the direction of the company's own engineering staff and will get under way within six weeks.

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Plans Utility Purchase

The Lower Colorado River Authority, through its manager, Max Starcke, is negotiating for the purchase of the Central Power & Light Company's electrical system at Luling, Texas. The city has a competing municipal system which will use LCRA power. The proposed sale would eliminate the competitive situation.

SAFE DRIVING ASSURED—Cleveland's new Main Street bridge is lighted by 139 Westinghouse sodium butterfly luminaires. A photocell turns the lights on automatically when natural illumination falls below the level necessary for safe driving. Thirty-five incandescent units light the underpasses at each end of the 1⅛-mile bridge

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Central Maine Power to Build New Plant

Directors of Central Maine Power Co. have voted to proceed at once with the construction of a new 20,000-hp. steam power plant to be located at Bucksport on land to be purchased from the Maine Seaboard Paper Co. The plant is expected to be completed by September, 1940.

The new steam plant will be tied into the company's 110,000-volt transmission system so that power generated by it will be available for use anywhere in the territory. Central Maine Power Company's lines are connected with Cumberland County Power & Light Co. and also with the Bangor Hydro-Electric Co.

Along with this additional power plant, it was also voted to build a 110,000-volt transmission line from a point near Pittsfield to the company's switching point at Windsor. At Pittsfield this line will connect with the 110,000-volt line running from Bingham to Bucksport and at Windsor it will connect with the 110,000-volt circuit which runs from Gulf Island to that point.

These additional facilities are made necessary by the sharp increase in load which has been developing in the company's territory for some time and is now increasing at a still more rapid rate.

McGraw Award Goes to Ralph M. Walker

Ralph M. Walker, president of Walker Electrical Co., Atlanta, Ga., received the James H. McGraw Award Contractor-Dealers Medal for 1939 at the annual convention of the National Electrical Contractors Association, held last week in Philadelphia.

Mr. Walker received the medal "in recognition of his contribution to the advancement of the contracting branch of the electrical industry, through his long and consistent promotion of a better understanding among electrical men of the principle underlying fair trade policy and the practical benefits of fair dealing."

President Earl Peak urged a conference by electrical manufacturers, wholesalers and contractors to study the possibilities of reducing the cost of wiring not by reducing standards but by the elimination of excess and duplicating varieties. This was adopted as a resolution.

R. W. McChesney, Washington, was elected new president. Next year's convention is to be held in Jacksonville, Fla., late in October.

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Mexico Power Strike

Striking workers of three electric companies, with headquarters in Puebla, Orizaba and Cordoba, left five Mexican states without electric service this week. The strike arose over a wage dispute, which efforts of the Labor Department of the government have failed to solve.

Chicago Light Meet Draws 400 Specialists

The importance of education in the advancement of modern lighting technology was stressed by O. R. Hogue, manager of lighting and wiring sales of Commonwealth Edison, during the eighth annual fall lighting school of Chicago's Lighting Institute last week. Approximately 400 utility lighting specialists, lighting equipment manufacturers and electrical contractors from four states attended the three-day sessions.

Lectures by local lighting specialists on the technique, economics and sale of modern lighting featured the sessions arranged primarily for men new to the lighting field. Specialized sessions on commercial, industrial and residential lighting were held for the veterans.

Speakers on the program included J. A. Harrington, J. V. Gaynor and E. D. Tilson of Commonwealth Edison, W. C. Westerberg, Underwriters Laboratories; E. E. Elliott, Benjamin Electric Manufacturing Co., and E. J. Phelan and E. R. D'Olive.

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A.S.M.E. Elects Officers; McBryde New President

Election of new officers for 1940 of the American Society of Mechanical Engineers has been announced by C. E. Davies, secretary of the society. The new officers will be installed during the annual meeting of the society in Philadelphia, December 4-8.

Warren H. McBryde, consulting engineer of San Francisco, was elected president. The new vice-presidents include: Kenneth H. Condit, National Industrial Conference Board, New York; Francis Hodgkinson, honorary professor of mechanical engineering at Columbia University and retired consulting mechanical engineer of the Westinghouse Electric & Manufacturing Co.; Jerome C. Hunsaker, aeronautical engineer and educator, Cambridge, Mass., and K. M. Irwin, Philadelphia Electric Co., Philadelphia, Pa.

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Sponsors Radio Program

Wisconsin Electric Power Co. is sponsoring a pre-Christmas promotional campaign which was inaugurated October 2 with a thirteen-week radio program broadcast each morning, except Saturday and Sunday, from 9.45 a.m. to 10.00 a.m. over station WISN. Featured on the program is Ida Bailey Allen, household adviser. Later in the fall the company will sponsor a $1,000 prize contest, featuring one hundred or more awards in the form of electrical merchandise certificates. Milwaukee electrical appliance dealers are cooperating in the campaign.

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Participate in Fair

The electrical industry took a prominent part in the Provincial Exhibition at Victoria, British Columbia, recently. The Greater Victoria Electrical Association had an exhibit demonstrating various types of lighting and introducing door chimes and other electrical novelties for the home. B.C. Electric Railway Co. had a display in two sections, one devoted to better lighting and showing the right and wrong way of illuminating the home, while the other featured the various lines of appliances handled by the company.

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Chicago Electric Exhibit

The seventh annual exhibit of industrial electrical equipment sponsored by the Electric Association for the Electrical Maintenance Engineers of Chicago will be held in the Chicago Lighting Institute, October 31-November 2. The exhibit will open on Tuesday evening, October 31, immediately following the annual dinner of the Electrical Maintenance Engineers. Reservations for space indicate that last year's total of 75 exhibitors will be exceeded. The exhibit this year will feature many new products, with an exceptionally large number of new developments in wiring materials and electrical equipment to be shown for the first time.

MEETINGS

National Electrical Manufacturers Association—Annual meeting, Palmer House, Chicago, Ill., October 22-27. W. J. Donald, managing director, 155 East 44th St., New York, N. Y.

Southeastern Electric Exchange—Fall conference, sales section, Henry Grady Hotel, Atlanta, Ga., November 2-4. J. W. Talley, executive secretary, 308 Haas-Howell Bldg., Atlanta.

Wisconsin Utilities Association—Electric section, commercial and technical divisions, Schroeder Hotel, Milwaukee, Wis., November 6-7. A. F. Herwig, executive secretary, Room 502, Brumder Bldg., 135 West Wells St., Milwaukee.

Edison Electric Institute—Annual national accounting conference, Edgewater Beach Hotel, Chicago, Ill., November 13-15.

American Society of Mechanical Engineers—Annual meeting, Bellevue-Stratford Hotel, Philadelphia, Pa., December 4-8. C. E. Davies, national secretary, 29 West 39th St., New York, N. Y.

Petroleum Electric Power Club—Eleventh annual conference, Texas State Hotel, Houston, Tex., December 14-15. H. E. Roberts, secretary and treasurer, Box 792, Joplin, Mo.

Gas Group to Plan Range Sales Drive

Good customer relations grow from good employee relations within the utility business, R. E. Fisher, vice-president of Pacific Gas & Electric Co., told the annual convention of the American Gas Association in New York last week. Mr. Fisher said that it has long been a problem of industry to transmit the philosophy of management to the employee, nor has it been easy to transmit the philosophy of employee to management. He suggested humanizing the organization.

E. R. Guyer, president of the Association of Gas Appliance and Equipment Manufacturers, said that "gas is on the march." He declared that in 1937 the ratio of gas range sales was 3.5 to one electric. "Today it is 3.92 gas to one electric."

Raise Drive Funds

The A.G.A.E.M. is raising $110,000 this year by obtaining $1 on each CP range and 10 cents on each modern gas range. This fund will be used for dealer trade paper advertising, employment of two additional representatives and staging of two major special selling drives during the year in promoting gas ranges. This fund is in addition to the $440,000 voted by the A.G.A. for national consumer paper advertising. Sales of gas ranges are running about 35 per cent ahead of 1938, when approximately 1,000,000 were sold.

More than 3,000 delegates attended the convention and made plans to stimulate expansion of uses for gas. James F. Pollard, president of the Seattle Gas Co., received the Charles A. Munroe award for having made the most outstanding contribution of an individual for the advancement of the gas industry. Mr. Pollard told the industry that it must repel defeatists who say that its $1,500,000 national advertising campaign cannot be increased at this time.

A report on gas air conditioning indicated that the industry is going ahead with plans to obtain this additional load.

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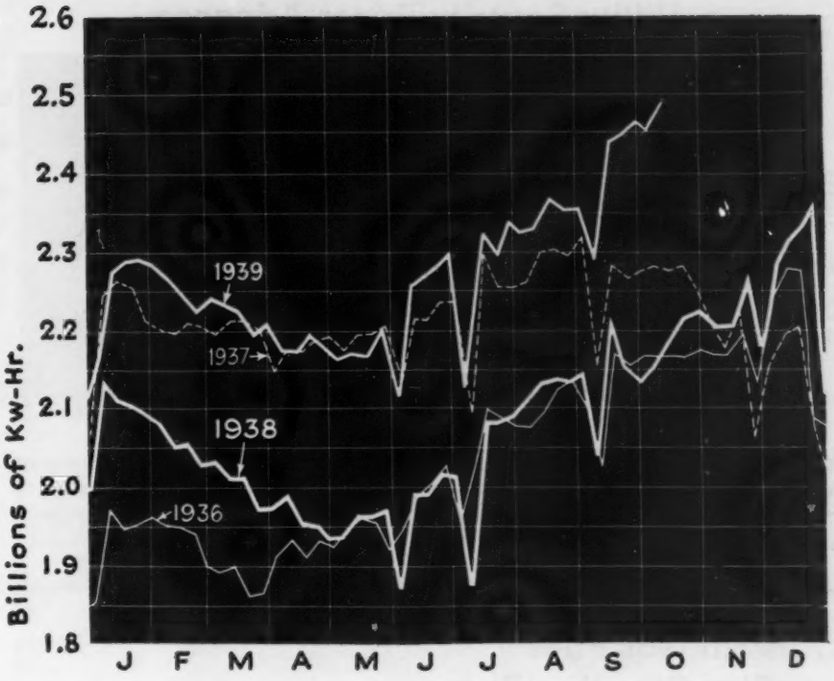
Cleveland Apparatus Show

Announcement has been made that the 1939 Electrical Apparatus Show will be held under the sponsorship of the Electrical League of Cleveland at the Hotel Carter, Cleveland, November 7-9. An attraction at the show will be a meeting for both sections of the Electrical Maintenance Engineers Association.

Week's Output Rises 14.3% Above Year Ago

Rising 1.6 per cent compared with the preceding week to 2,494,630,000 kw.-hr., according to the Edison Electric Institute, the output of the electric light and power industry during the week ended October 14 exceeded that of the corresponding period a year ago by 14.3 per cent and established a new all-time record. Production surpassed that of the like week in 1937, which heretofore has been the high year for this season, by 9.6 per cent.

The increase over 1938 during the past three weeks—successively 15.5, 14.4 and 14.3 per cent—was the largest thus far this year, though it was closely approached by the 14.2 per cent the week of July 1. In making this comparison, however, hurricane conditions in New England last year must not be overlooked.



Weekly Output, Millions Kw.-Hr.

1939		1938		1937	
Oct. 14	2,495	Oct. 15	2,183	Oct. 16	2,276
Oct. 7	2,465	Oct. 8	2,154	Oct. 9	2,280
Sept. 30	2,470	Oct. 1	2,139	Oct. 2	2,276
Sept. 23	2,449	Sept. 24	2,154	Sept. 25	2,266
Sept. 16	2,444	Sept. 17	2,215	Sept. 18	2,281
Sept. 9	2,290	Sept. 10	2,048	Sept. 11	2,154

Per Cent Change from Previous Year

	Week Ending		
	Oct. 14	Oct. 7	Sept. 30
New England	+14.6	*+20.8	*+30.5
Middle Atlantic	+13.2	+14.7	+14.7
Central Industrial	+18.7	+17.3	+17.9
West Central	+ 8.9	+ 8.1	+ 8.4
Southern States	+12.8	+11.1	+12.6
Rocky Mountain	+20.4	+24.1	+24.9
Pacific	+ 7.0	+ 6.5	+ 5.9
United States	+14.3	+14.4	+15.5

*Reflects hurricane conditions in 1938.

In the Central Industrial area the increase of 18.7 per cent over 1938 constitutes a new maximum, partly explained by a sag in that year. In the Mountain states the margin continues above 20 per cent. The other regions also generally took part in the upward movement.

Merged Power Group Headed by Secy. Ickes

Consolidation of the government power committees in an effort to develop a national program based on national defense and peace-time needs has been effected by President Roosevelt. The work of the National Defense Power Committee, headed by Assistant Secretary of War Louis A. Johnson, has been transferred to the National Power Policy Committee, headed by Secretary of Interior Harold L. Ickes. The following government officials will compose the new body:

Secretary Ickes, chairman; Mr. Johnson, Leland Olds, Federal Power Commission; Jerome N. Frank, Securities and Exchange Commission; John Carmody, Federal Works Administrator; Harry Slattery, Rural Electrification Administrator; David E. Lilienthal, T.V.A., and Paul J. Raver, Bonneville Power Project Administrator.

In a letter to Mr. Ickes and Mr. Johnson, President Roosevelt said:

"The National Power Policy Committee shall devote itself to the development of a national power policy in the interest of national defense as well as peace-time needs. It shall consider power problems common to the several departments and agencies represented on the committee, with a view to the co-ordinated development of a consistent federal power policy.

"It shall deal with matters of co-operation between the public and private agencies. It shall advise me in matters of national power policy.

"The National Defense Power Committee has completed the major part of its work in estimating the probable power needs of the nation in peace and in war. The National Power Policy Committee should be in a position, therefore, to give its first attention to the immediate concrete steps necessary to assure the meeting of these needs."

•

Utility Wins Tax Case

The NY PA NJ Utilities Co., Wilmington, Del., as successor to the Rochester Central Power Corp. (Delaware), has reached an agreement with government attorneys under which the government withdrew its claim for $98,737 income and $35,904 excess profits taxes for 1934 against the Rochester corporation. The petitioner contended the government erroneously disallowed a deduction of $717,777 in interest accrued in the year.

Oregon Cement Company Files for Hydro Project

The Beaver Portland Cement Co. of Portland, Ore., has filed with the Federal Power Commission its declaration of intention to construct a small water-power project on Rogue River in Josephine County, Oregon. The project would consist of a wing dam paralleling the thread of the stream, a diversion canal about 2,000 ft. long located along the westerly bank of the river and a power house. The project would be used to serve the city of Gold Hill, Ore., and for mining and manufacturing purposes in connection with the company's business as a manufacturer of cement.

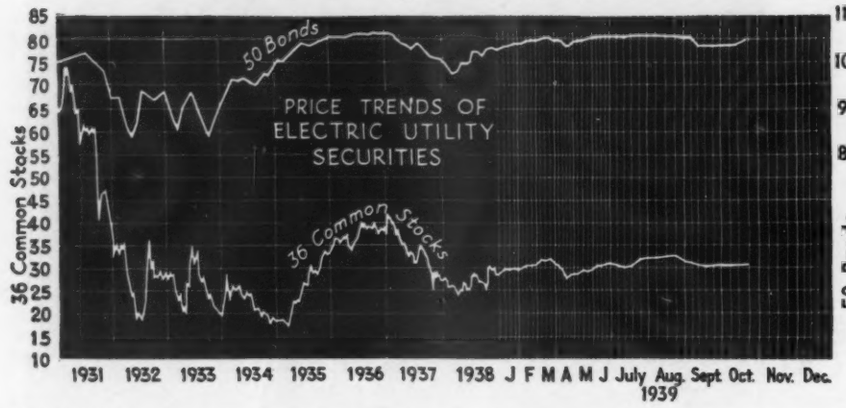
•

Lets Turbine Contract

Safe Harbor Water Power Corp. has awarded a contract to Baldwin-Southwark Corp., subsidiary of Baldwin Locomotive Works, to complete a 42,500-hp. Kaplan propeller type hydraulic turbine.

Certain parts of this turbine were furnished under a previous contract. The total value of this order is approximately $305,000.

Utility Security Prices Advance


50 Bonds
PRICE TRENDS OF ELECTRIC UTILITY SECURITIES
36 Common Stocks
36 Common Stocks
50 Bonds
1931 1932 1933 1934 1935 1936 1937 1938 J F M A M J July Aug. Sept Oct. Nov. Dec. 1939

Electric light and power securities moved upward during the past week. "Electrical World" stock index advanced to 31.1 from 30.5 the preceding week; last year 30.0. "Electrical World" bond index rose from 104.8 last week to 105.1, the highest point since the first week in September

General Gas Files Simplification Plan

Securities and Exchange Commission has announced that the General Gas & Electric Corp., a subsidiary in the Associated Gas & Electric Co. holding company system, had filed an application for approval of a plan of divestment of assets, simplification of structure, and equitable distribution of voting power under Section 11(e) of the Holding Company Act. Under the plan the corporation proposes to eliminate all of its debts and to have outstanding only two classes of stock in place of the seven classes now outstanding.

The plan provides for the surrender by Associated Gas & Electric Corp. to General Gas & Electric Corp. of all its holdings in securities of that corporation in exchange for 885,048.2 shares of the new common stock and the delivery by General Gas & Electric Corp. to Associated Gas & Electric Co. of the entire investment in Southern Electric Utilities Co.

The commission has approved, subject to conditions, amendments to an application by the Central States Power & Light Corp. and the trustee for the Utilities Power & Light Corp. covering a proposal by Central States Power to invite tenders of its first mortgage and first lien 5¼ per cent gold bonds, series of 1953, at 72 and accrued interest to Sept. 30, 1939, and to purchase such bonds in an amount sufficient to exhaust the sum of $1,855,413.

•

Abitibi Plan Would Give Control to Bondholders

Control of the Abitibi Power & Paper Co. would be placed in the hands of the present bondholders under the proposal for reorganization of the company announced recently by Thomas Bradshaw.

As summarized the plan is: (1) That existing bondholders be given forty new cumulative convertible preferred, $25 par, carrying dividends of $1.85 and callable at $37 a share. (2) Each existing 7 per cent preferred share to be converted into twelve new common shares. (3) Each existing 6 per cent preferred share to be converted into four new common shares. (4) Each existing common share to be converted into one-tenth of one new common share. (5) Unsecured creditors to accept a moderate reduction in the amount of their claims and be paid in cash over a period of three years.

•

Associated Extends Plan of Integration

Associated Gas & Electric Co. has taken steps in Ohio toward carrying out the program for integration of the Associated System under the requirements of the Public Utility Act of 1935.

Ohio Midland Light & Power Co. and Portsmouth Gas Co., subsidiaries of Associated Electric Co., and General Utilities Co., New London Light & Power Co., Western Reserve Power & Light Co. and Ohio Northern Public Service Co. have applied to the Ohio Utilities Commission for permission to merge into Ohio Northern Public Service. Name of the consolidated corporation would be changed to Ohio Electric & Gas Co.

Application sought permission to capitalize the new organization with $3,300,000 of 4 per cent 25-year first mortgage bonds, $1,200,000 of 6 per cent preferred stock and 85,000 shares of $1 par common stock. New issues would be marketed at not less than 99 for the bonds, 94 for the preferred and 7¾ for the common.

•

Some Utility Stocks Sold by United

United Corporation has sold blocks of securities of utility companies, it was disclosed recently by George H. Howard, president, in a letter to stockholders covering operations of the corporation for the third quarter of this year.

United disposed of 13,500 common shares of Columbia Gas & Electric Corp. and 14,300 common shares of the Niagara Hudson Power Corp. through open market sales on the New York Stock Exchange and the New York Curb Exchange. This is the first step by the corporation to divest itself of utility securities in its portfolio.

While the corporation was selling these securities it was purchasing in the open market large blocks of common and capital stocks of leading industrial corporations, with the result that in the third quarter of this year the corporation spent $1,176,882 on such purchases. Mr. Howard's letter also disclosed that the New York United Corporation, a wholly owned subsidiary, was dissolved on September 13 and all of its assets transferred in liquidation to the United Corporation.

•

Makes Payment on Arrears

Mississippi Power & Light Co. has declared a dividend of $2 a share on its $6 preferred stock, payable on November 1 to holders of record of October 14. The stock will be $6.75 in arrears after payment of this dividend. On September 1 last the company paid 50 cents on arrearages.

Utility Reports

	Net Income 1939	1938
*American Gas & Elec. and subs.	$13,366,640	$11,826,814
*Arkansas Pwr. & Lt.	1,405,143	1,171,626
*Carolina Pwr. & Lt.	2,329,732	2,506,152
*Central Illinois Light	2,047,801	1,913,934
*Duquesne Light	9,941,219	8,892,544
*Electric Power & Light and subs.	4,283,922	5,620,369
*Florida Power & Light	1,545,301	1,775,221
*Gulf States Utilities	2,367,252	2,024,072
*Oklahoma Gas & Electric	2,716,825	2,444,669
*Puget Sound Pwr. & Lt. and subs.	1,491,310	968,771
*San Diego Consol. Gas & Elec.	1,435,735	1,290,265
*Utah Power & Light	1,642,342	1,360,413
*Virginia Elec. & Pwr.	3,776,727	3,396,303
*Wisconsin Public Serv. and subs.	1,588,477	1,281,786

*Twelve months ended August 31.

OPERATING PRACTICES

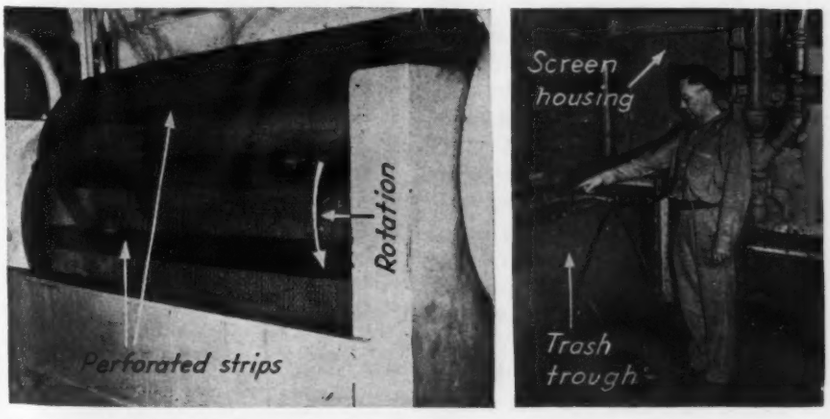
Port Washington Meets Fish Problem

Scoop-shaped perforated strips of sheet steel have been added to the face of the two traveling circulating water screens at Port Washington station of the Wisconsin Electric Power Company to elevate and thus keep fish and trash moving rather than allow them to pile up in front of the screens, where they may cause a reduction in the flow of water to the condensers. Large schools of small fish are frequently encountered in this portion of Lake Michigan at certain times of year.

The screens at Port Washington consist of 29 screen baskets of $\frac{3}{8}$-in. mesh No. 12 BWG copper screen. Each screen basket is 2 x 8 ft. and is divided into two parts longitudinally by the perforated strips which are bolted to the screen and frame. The screens revolve at 12 ft. per minute.

Fingerling fish that are caught in the meshes of the screen or in the "elevator strips" are removed by hand (when schools are sufficiently large to constitute a menace to water flow through the screens) and thrown into the refuse trough that empties into Lake Michigan at a point where they cannot again easily reach the intake tunnel.

In freezing weather, when the discharge water is recirculated into the intake to melt ice, the fish cannot be returned to the discharge tunnel directly. For this reason the refuse trough has been lined with removable galvanized "baskets" conforming to the shape of the trough. Fish are accumulated in these baskets and returned to the lake at a point remote from the plant where they can do no harm. In this way the lake's stock of fish is not depleted and the intake is cleared of heavy schools of fish that occasionally accumulate in the spring and fall.



Elevate fish and trash and return fish to lake at remote point

Perforated steel strips or traveling circulating screens get fish and trash out of the way (left). Fish removed from screens are dumped into removable baskets in refuse trough and later returned to lake at distant point (right).

•

"Clamp-On" Ammeter Shows Blown Limiters

By C. P. XENIS and E. WILLIAMS
Consolidated Edison Company of New York, Inc.

Clamp-on type ammeter locates blown limiters on secondary networks of utility system

A "clamp-on" type of ammeter furnishes a simple and practicable method for locating blown limiters on the secondary distribution network system of Consolidated Edison Company of New York, Inc.

In the three years operating experience of the utility with limiters, the blown limiters have operated with no change in external appearance which would make it possible to differentiate between blown and unblown limiters. This ammeter, suitable for use on both a.c. and d.c. circuits, is applied over the cables in the manner shown without interrupting the circuit or cutting into the insulation and thus reveals blown limiters by the absence of current flow.

No routine inspection is made to find blown limiters since their operation is revealed by the knowledge that a fault has taken place as evidenced by smoke at the fault or by the report

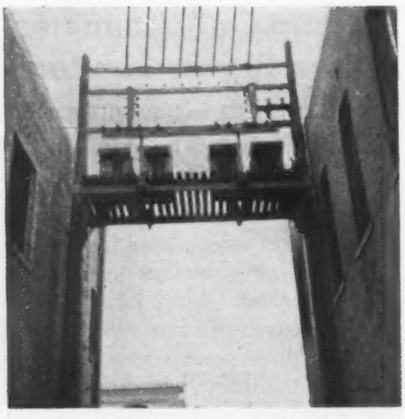
of low voltage or loss of supply from consumers affected by the trouble.

As the result of the company's experience in locating blown limiters, it seems doubtful that any benefits would result from the incorporation of indicating devices to reveal a blown limiter.

•

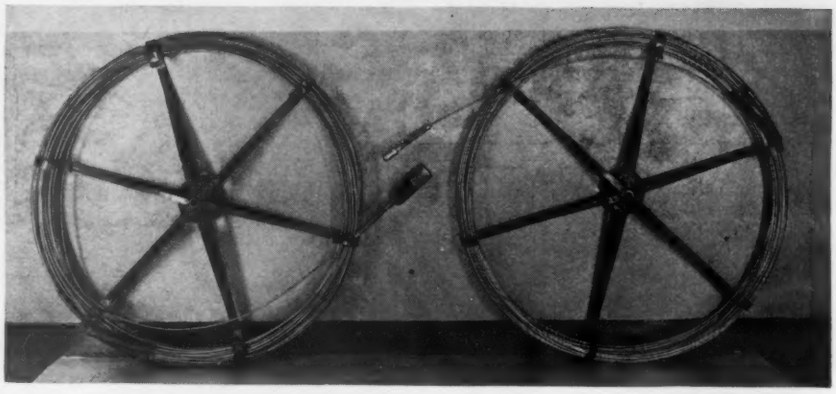
Alley Distribution Construction

Alley construction as viewed from a main street



Transformer bank platform extending across an alley

To keep overhead distribution from the main streets in North Platte, Neb., the Northwestern Public Service Company has used the paved alleys of the city. An H-frame type of structure is used, with primaries on the top crossarm and secondaries on racks. Transformer banks are mounted on platforms extending across the alley. The construction has been used for many years and has been found economical and safe, with a good appearance.



Steel Duct Rods

Flexible steel rods are used in place of wooden rods usually employed for this work by a large metropolitan system. They are made of 5/16-in. steel, one 350 ft. and the other 450 ft. long. To use them the reels are mounted on beds provided with a guide which facilitates coiling the rod.

On ducts longer than 450 ft. a rod is inserted from each end, and when the two meet they are joined by a "rod catcher," which consists of a pick-up or female fitting and a leader or male fitting as shown. After the two have been joined they may be separated by inserting a tool into the pick-up.

•

Sequence Meters Pay Dividends

By A. L. GATES,*
Kansas Power Company, Concordia

Sequence metering of the outdoor type on the Kansas Power Company system has reduced current diversion and improved public relations.

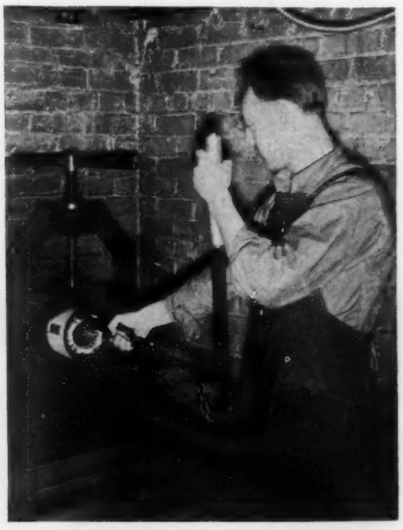
The first town selected to be changed over was one of about 275 meters. Losses in this particular town had been running high, between 25 and 30 per cent as computed by comparing the total of the customers' meter readings with the month's readings of the master meter. The change to the new metering sequence was made in July and August of 1937. Losses in this town averaged 28.8 per cent for the year 1936. For the year following the change they were reduced to 15 per cent. Actual kilowatt-hours sold to the customers increased 14 per cent in the same period. None of this increase can be attributed to normal growth, as the kilowatt-hours delivered to the town as indicated by the master meter were actually less for the year following the change in meters than for the year immediately preceding it.

An actual comparison of revenues received from this town before and after the change is not practical because of a rate reduction which was put in effect. However, in spite of the rate reduction of approximately 8 per cent, there was a slight increase in revenue during the year following the change. If we take the increased

[*Continued on page 70*]

*Abstract of paper, Missouri Valley Electric Association.

Removes Stator Coils Prior to Rewinding



Motors to be rewound for frequency change in the shop of the Gary (Indiana) Heat, Light & Water Company are quickly stripped of their coils with the puller shown. This device consists simply of a bench-mounted lever attached by a chain to a pair of pliers whose jaws have been ground out to fit the curve of the coils. With the motor firmly held in a bench vise this apparatus removes the coils with ease and without the slightest delay.

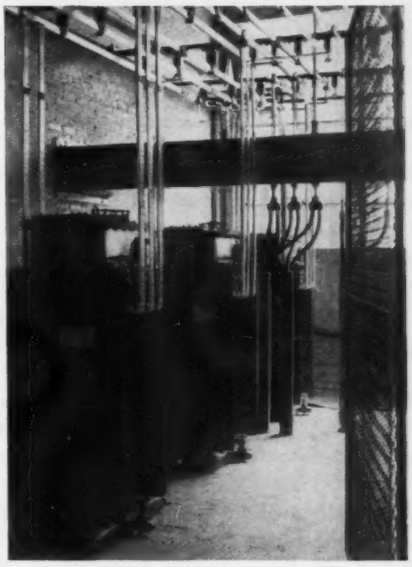
Savings like these for you

with G-E Pyranol Transformers for Power and Lighting Loads

SAVINGS in installation costs alone will usually make it profitable for you to select G-E Pyranol transformers for all indoor transformer installations in your plant. No vault is required with noninflammable Pyranol, and Pyranol transformers can be installed quickly, easily, and inexpensively.

They can be located near load centers, at any place in your plant—even on overhead platforms. Load-center distribution brings you extra savings by eliminating long runs of secondary copper, reducing line losses, and improving voltage conditions so that lamps, motors, furnaces, and other equipment operate more efficiently.

Find out for yourself how much you can save by specifying Pyranol transformers for your lighting and power circuits. Ask your G-E representative for complete information, or write to General Electric, Dept. 6-201, Schenectady, N. Y., for Bulletin GEA-2637.

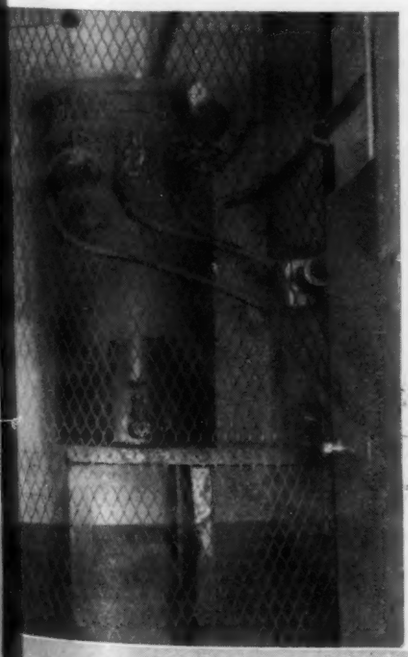


SAVED $500 ON INSTALLATION

"We saved $500 on installed cost by using a Pyranol transformer to supply a lighting load," says R. H. Lewis, electrical superintendent of the Motor Wheel Corporation, Lansing, Mich. This saving represented the cost of a vault which would have been required had an oil-filled transformer been used, plus the value of floor space released because the Pyranol transformer was placed on an overhead platform. Furthermore, by installing the 100-kva, 480–240/120-volt Pyranol transformer right at the load center, the cost of running a heavy three-wire secondary for 500 feet was avoided.

AVOIDED COST OF UNDERGROUND VAULT

The Byron Jackson Company, Los Angeles, selected Pyranol transformers for this 600-kva bank because the use of oil-filled transformers would have necessitated the digging and lining of an underground vault in the production area of the plant. The Pyranol transformers fit into space that could not be used for production. Again, there were savings in installation costs and floor space. These transformers, supplying power for the testing of horizontal pumps driven by 2300-volt motors, are rated 2400–240/480 volts and are used as step-up units.

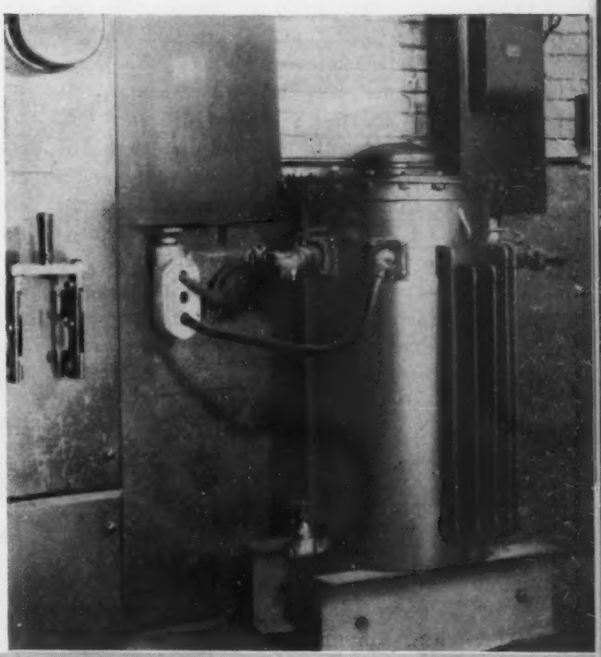


CUT COPPER COSTS IN HALF

This Pyranol transformer supplies power for the lighting system in the new recreation building of an Alabama cotton mill. Here, noninflammable Pyranol made possible an indoor installation that saved 50 per cent in the cost of copper for the lighting circuits. Better voltage conditions resulted from the installation of the transformer near the load center.

SAVED $163 ON LIGHTING MODERNIZATION

This Pyranol transformer saved $163 for the Allied Paper Mills, Kalamazoo, Mich., when the plant lighting system and lighting circuits were modernized. In addition to the original installation savings, the location of the Pyranol transformer at the load center eliminated long runs of secondary copper, reduced line losses, and resulted in improved voltage conditions on the lighting circuits. The transformer is rated 75 kva, 460–115/230 volts.



GENERAL ELECTRIC

300-83

Oil Trucks for 66-Kv. Cable

A special truck for maintaining 66-kv. solid insulation cable on a large metropolitan system consists of a pump driven by the truck engine (left) for draining manholes, a portable 6-gal. tank for filling manhole oil tanks, 15-gal. oil storage tanks, a vacuum pump installed in the right-hand compartment visible in the interior view of the truck (right), seats for a four-man crew and a cylinder of nitrogen, which is used for forcing oil from the 15-gal. storage tanks into the portable oil tank.

number of kilowatt-hours sold during the year 1938 and multiply that by the average rate received prior to the rate reduction, we arrive at a figure which represents a return of 24 per cent on the cost of making the change, excluding the cost of new meters themselves. If we include the saving on line loses at the cost of production, the return on the added investment is raised to over 90 per cent. The cost of making the change in this particular town was $6.30 per meter, exclusive of the cost of new meters.

Another town of about 180 meters was completely changed over to the new sequence in May, 1938. Comparisons were made between operations the last seven months in 1938, as against the last seven months of the year 1937, preceding the change. In this case the losses dropped from 23.3 per cent for the period preceding the change to 13.6 per cent for the period following the change. The kilowatt-hours sold to consumers increased 13.25 per cent. The new sequence in this instance was followed by an actual increase in revenue of 10 per cent. As in the previous case mentioned none of this increase can be attributed to increased consumption, as there was no increase in the kilowatt-hours delivered to the town.

We are convinced that the reduction in losses and the increase in kilowatt-hours sold have been brought about by the practical elimination of current diversion. We believe that our own experience has proved that the new sequence metering is the most logical cure for the diversion evil.

•

Special Tools Speed Switchboard Wiring

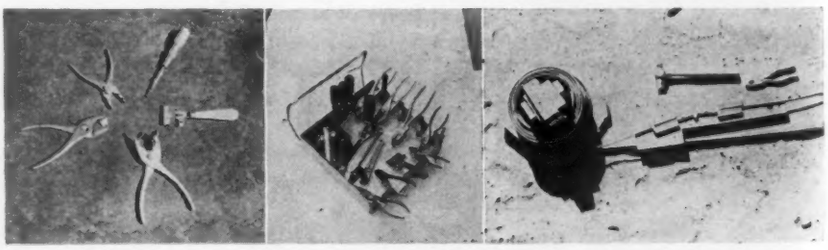
By A. W. GAY
Nevada California Electric Corporation
San Bernardino, Calif.

A special set of tools and tool kit, all of simple design, is being used at Nevada California Electric Corporation in connection with wiring switchboards using standard No. 12, slow-burning switchboard wire.

Side-cutting pliers, eyelet pliers—for making four sizes of eyelets for standard-size screws—diagonal pliers, sharp-nose pliers and several sizes of socket wrenches comprise the assortment of standard tools. In addition to these, the following special tools have been designed: Offset pliers, for bending the wire in one operation to cross over one or more wires; corner pliers, for bending right-angle corners; crimping pliers, for removing insulation without leaving any ragged edges; spring-point screwdriver, for inserting, starting or removing screws in locations which are hard to reach.

A tool kit, made up of sheet metal, has parts of its sides snipped and turned down to form holders for the pliers. Boxes are fixed inside to hold small parts, and brackets accommodate screwdrivers. This scheme prevents fumbling for tools and prevents them from becoming scattered.

A wire straightener was made up by using a board base and mounting thereon a payoff reel and a series of pulleys and guides, arranged to remove both curves and short kinks.



Simply designed tools facilitate wiring of switchboards

(Left) Offset pliers, corner pliers, crimping pliers and spring-point screwdriver comprise special tools.
(Center) This simple tool kit, with removable handle, keeps tools in place, where they can be reached quickly.
(Right) A simple arrangement of pulleys and guides makes an effective wire straightener.

VERSATOL

REG. U.S. PAT. OFF.

INSULATED CABLE

0.010

New Savings Now Possible

ALL THREE properties most desired in a rubber insulation for cable are combined in Versatol—long life (504), heat resistance (75 C), and moisture resistance (0.010). The last property makes possible new savings.

AWHILE ago, the Underwriters' Laboratories, Inc., approved the use of braided cable with Versatol rubber insulation for use in wet locations.

That ruling has substantiated a previous recommendation of ours that Versatol can often be safely used without a lead sheath. Such an omission results in savings not only in the cost of the cable itself but also in the cost of installation.

Consider, too, submarine cable: for some large-conductor, low-voltage runs, the savings can amount to as much as 40 per cent.

The reason these savings are possible is the unusually low moisture-absorption factor of Versatol—0.010 gram per square inch of surface submerged. This value may actually be lower, but the guarantee is 0.010.

Aging and Heating Properties

In addition to moisture resistance, you get in Versatol the long-life property of 504-hour aging in the oxygen bomb (or 20-hour aging in the air bomb). These are the most severe aging tests.

You also get the high operating temperature of 75 C. This may not only permit running the cable in hot locations, but it may also effect savings in conductor size. Such savings have amounted to as much as 35 per cent.

Versatol Tellurium

The combination of Versatol (for dielectric strength) and a tellurium-rubber sheath (for mechanical strength) forms a simple nonmetallic "parkway" cable that is moisture-resisting, long-lived, low-priced, and easy to install. It can be buried directly in the earth, run on the ground, under water, or overhead—for all sorts of power, lighting, and control circuits. This all-rubber (RR) cable is worth investigating for many circuits where heretofore other nonmetallic-armored or metallic-armored types have been used. It may save money.

How to Make Joints

We have just issued a new 16-page booklet largely devoted to tellurium-rubber-sheathed cable, but including also certain braided types. It is, "How to Make Cable Joints—Nonleaded Cable." We shall be glad to send you a copy; address the nearest G-E sales office or General Electric, Dept. 6—201, Schenectady, N. Y. Ask for Bulletin GEA-2988.

GENERAL ELECTRIC

520-171

INSULATED CABLE—ALWAYS THE RIGHT TYPE FOR EACH JOB

INDUSTRIAL ENGINEERING

Limit Switch Scheme Discharges Batch Tank

The last four of the sixteen ingredients that go into "Italian Balm," made by the Campana Corporation at Batavia, Ill., are added in sequence as six batch tanks mounted on a motor-driven turntable are indexed under ingredient-weighing scales and discharged automatically by a unique system of limit switches.

Batch tanks are indexed by a limit switch mounted on the floor near the rim of the turntable at point B in the accompanying illustration. As the equally-spaced tanks approach a new position a lug, attached to the turntable frame, strikes the limit switch, de-energizing the turntable motor and applying an electric brake. This brings each tank to rest opposite its proper station.

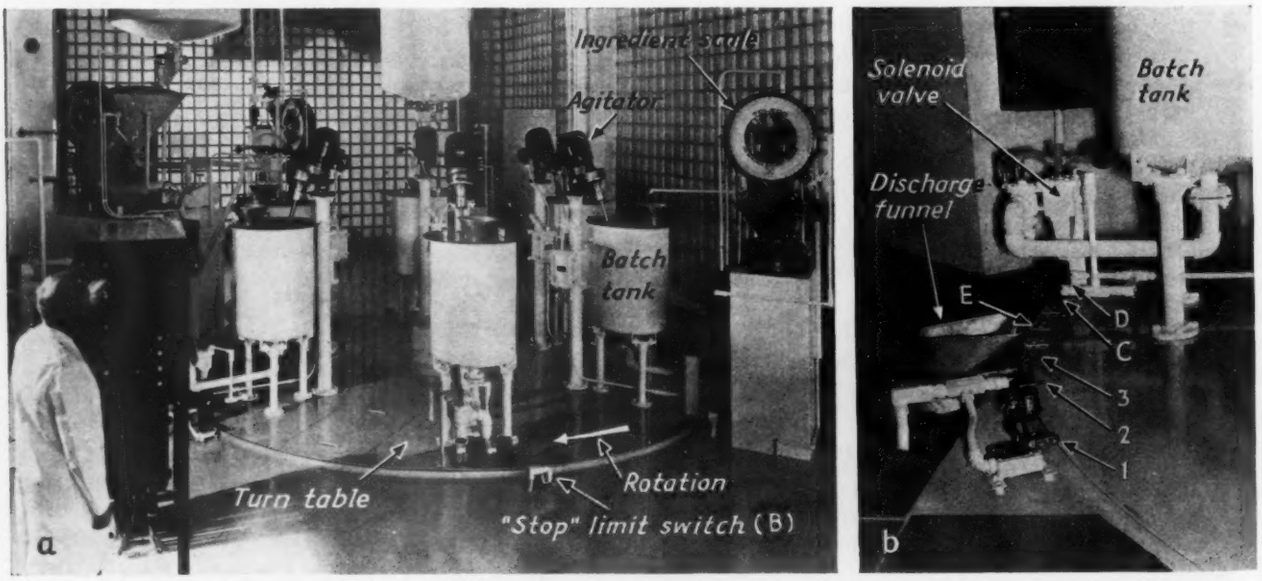
Each time the turntable is indexed to a new position one of the six tanks is brought over the discharge funnel to be drained, having completed its cycle, during which four ingredients have been added at intervals and the entire mixture agitated. The system of switches at the rim of the turntable automatically stops the tank's agitator and opens the solenoid valve, discharging the tank's contents to storage.

Operation of the limit switches is described under the accompanying illustrations.

Watt-Hour Meter As a Detective

The cost of the ordinary standard watt-hour meter is very reasonable and one should be installed for each department and each important drive; the cost can easily be returned by the discovery of just one case where power may be saved.

Besides being a "detective," the meter also makes it possible to allocate costs of power on a fair basis to each operation or department. In most cases readings can be taken every month, though on important drives it is customary in some companies to take them daily. When a series of readings are obtained either



Limit switch scheme automatically discharges turntable-mounted mixing tanks

(a) Batch mixing tanks on turntable are indexed under automatic ingredient weighing scales as lug on turntable strikes limit switch B, stopping turntable motor.

(b) As batch tank outlet comes over discharge funnel, lug E strikes limit switch (1), energizing solenoid (2) and causing it to lift toggle switch (C), opening the solenoid valve and discharging the batch tank. Stop (3) operates on toggle switch (D) to stop the agitator while the tank is being discharged. As the turntable starts up again after discharge of tank is complete, stop (3) knocks down the toggle switch (C), closing the solenoid valve to prepare the tank for a new batch.

$12,700 Capacitor Installation

Saves $3600 Yearly

on Power Purchases

And brings seven additional savings to Michigan utility

THE CONDITIONS

The Michigan Gas & Electric Company, Southern Division, serving a peak load of 4000 to 5200 kw, generates about 2600 kw in its three hydro plants and purchases the rest of its requirements from a neighboring utility.

The purchased power is billed on a demand basis, with credits and penalties according to whether the power-factor is above or below 85 per cent. However, both the minimum billing allowed and the charge for the first block of power purchased are based on 250 hours' use of the *maximum* monthly demand.

THE PROBLEM

The importance of maintaining high power-factor (especially during high water periods when only the minimum amount of power is purchased) is apparent from these conditions.

Inability to boost voltage sufficiently high at the hydro plants to provide for reactive voltage drop to the points of interconnection and to the more distant system loads, has necessitated calling upon the purchased power source to supply a large amount of reactive component. This has resulted in low power-factors (as low as 61%) because the kwh requirements at such times have been low, while reactive kva remained high, with consequent costly purchased power.

In addition, from one to five hydro generators were being operated as synchronous condensers to maintain reasonable transmission voltages, which meant a great waste of hydro power.

THE SOLUTION

To improve the low power-factor and to eliminate other unfavorable conditions, 1550 kva of distribution-type capacitors were installed.

THE RESULTS

1. Average power-factor of purchased power improved from .85 to .99. This earns purchased power billing credit of 4.5% or $3600.00 annually, showing a 28.3% return on the over-all investment from this saving alone.
2. 1000 kva reduction in average monthly demands of purchased power.
3. Twenty-five per cent reduction in energy used for generator excitation.
4. Additional 800,000 to 1,000,000 kw-hr annual output from water formerly wasted operating generators as condensers.
5. Several feeder overloads relieved, postponing investment in rebuilding.
6. Released 10% to 30% more capacity in each substation—in some cases postponing the increase of substation capacity for two years.
7. Gained 700 kw additional peak capacity in hydro plants.
8. Postponed $1800 investment in regulating equipment.

SAVINGS FOR YOU?

You also may obtain significant savings from the installation of capacitors. Only a check of your system conditions will tell. A G-E representative will be glad to assist. Why not find out if you are missing any opportunities to cut costs? Communicate with the nearest sales office or address General Electric Company, Schenectady, N. Y.

HOW RELIABILITY IS BUILT INTO PYRANOL CAPACITORS

The winding of the rolls of foil and Kraft paper for G-E capacitors is entrusted to experienced operators—some with twelve or more years behind them—working on specially-designed winding machines. Throughout the manufacture of capacitors, skill of workmen and accuracy of machinery blend to give these units a reliability best attested by their record in service—99.8 per cent.

The G-E ten-million-volt lightning demonstration at the New York World's Fair uses 102 Pyranol capacitors, each rated 100,000 volts

GENERAL ELECTRIC

360-148

daily or monthly for some time a record will show any variations up or down. There should be an explanation for any marked difference in consumption of power. If there is no way of explaining the difference, the maintenance crew should be on the lookout. It may mean something wrong in the motor, in the accessories, in the drive, or in the machinery.

In one case where a watt-hour meter had been installed on a large motor driving a line shaft it was noticed that the daily readings began to increase from 1,150 kw.-hr. to 1,350. The bulk of the power was being used to drive an augur machine in a brick plant, although there also were conveyors, elevators and other machinery driven by the same shaft. The increase in power could not be accounted for by any change in process or by any marked difference in the raw materials being used. After some study most of the machinery was given a clean bill of health. When it came to the augur machine, however, the trouble was found. It is a known fact that more power is taken after the augur has become worn to some extent. In this case the augur was worn somewhat, but not enough to make 200 kw.-hr. difference in a single day.

Worn Machine

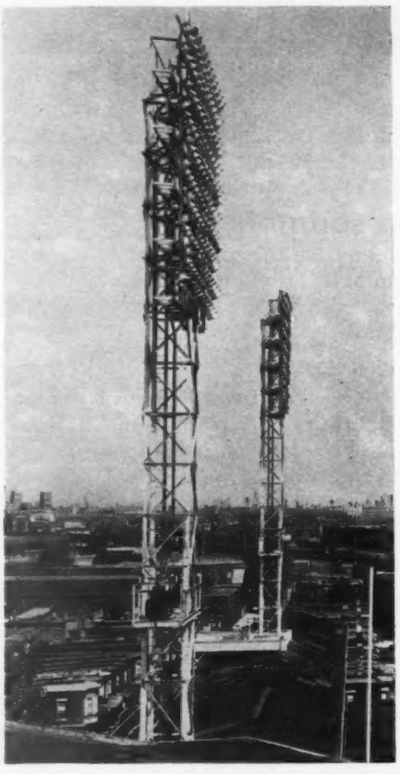
The bearings had become worn and the augur was being supported partially at least by the casing. By replacing the bearings and realigning the master gear and pinion the machine was brought back into first-class condition. Worn parts of the augur were also replaced. When the machine was placed in service again the watt-hour meter readings went down to 950 to 1,000 kw.-hr. a day, making a saving of around 300 kw.-hr. for each day's run, or in 24 days of operation 7,200, which would mean a substantial saving that would easily cover the cost of metering.

Of course it might be said that should the machinery be kept in first-class condition no meter would be needed. It is, however, extremely difficult to tell exactly what the internal condition of a machine is until it is taken down, and it is also expensive. On the other hand the meter will discover troubles long before anything shows up by external inspection and in many cases preventive measures may be taken which will lessen greatly the cost of replacements and repairs.

Primary Distribution for Baseball Lighting

By E. B. KARNS
Lighting Division,
Westinghouse Electric & Manufacturing Company

Operation at 115 volts of the 780 1,500-watt, 105-volt lamps used in floodlighting Shibe Park in Philadelphia for night baseball increases the light output about 35 per cent and the energy input only about 16. To obtain the close regulation of lamp voltage necessary for maintenance of this calculated desirable operating condition required careful engineering of the distribution system that feeds the total of 1,357 kw., divided among eight banks of floodlights spaced around the park.



Transformers mounted on tower platforms

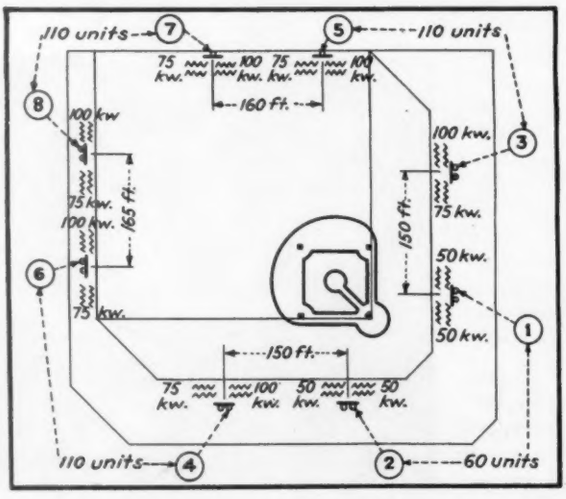
Primary distribution is used. Two 2,300-volt, two-phase feeders run underground from the service entrance vault under the grandstand to the eight towers, half of the lamps in each bank connected to one feeder and half to the other. The two towers adjacent to home plate carry 60 lamps each. On each of these are mounted two 50-kw. transformers. The six other towers have 110 lamps each, and each of them has a 75- and a 100-kw. transformer. Six of the towers are erected on the stands and two stand free in right field. The twelve transformers above the stands are Inerteen filled; the four others contain oil.

Secondary circuits calculated for 2 per cent drop are carried from the transformers up the towers in conduit. Distribution panels are mounted inside of each tower at the back of the service walkway. Separate branch-circuit fuse blocks for each floodlight are housed in galvanized steel weatherproof cabinets.

The branch circuits from the fuse cabinet to the floodlights are carried in conduit along the underside of the crossarms. A condulet is set adjacent to each floodlight. Each floodlight is provided with a flexible duplex rubber-covered asbestos insulated cable and enters the condulet through a porcelain fitting.

To eliminate the possibility of electrical outage, dual service is provided. This service is 2,300-volt, 60-cycle, two-phase, three-wire primary and is brought in through oil circuit breaker cubicles. An additional tie-breaker cubicle, electrically interlocked with the dual service entrance cubicles, is installed to transfer all service automatically to either of the two incoming feeders upon the failure or interruption of service on the other. Load is controlled by two main feeder switches.

The engineering and construction of this job was done by the Utilities Engineering Company of Philadelphia.

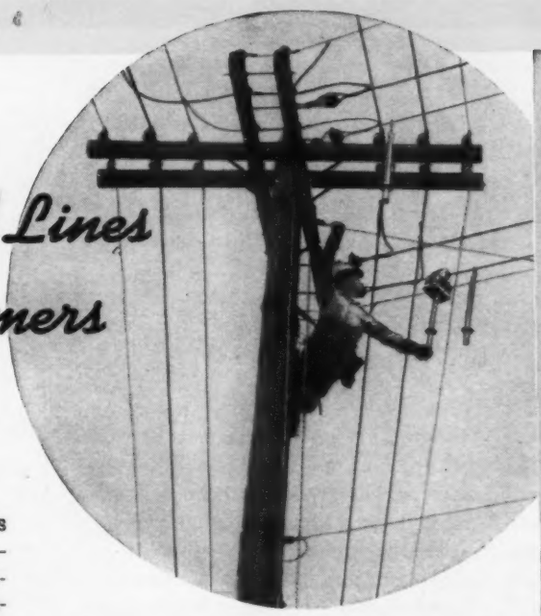


Plan of power locations in Shibe Park

Serve More Pay Load with Your Lines

NEW G-E VARMETER Measures Reactive Kva in 10 Minutes!

No Cutting of Lines
No Transformers



G-E varmeter and voltage dividers connected to line

Type AE-1 Electrostatic Varmeter for transmission-line analysis

TO help you bring your lines nearer unity power-factor—by aiding you in placing capacitors intelligently—that's the principal purpose of General Electric's new varmeter!

It offers the simplest and quickest portable means of measuring vars (reactive volt-amperes). You can set it up and get a reading in 10 minutes.

WHAT IT DOES—The G-E portable varmeter permits quick determination of current up to 300 amperes. And, by using voltage dividers, you can measure line volts, and vars—both lagging and leading—without complicated readings, without expensive equipment, without cutting into the line.

SIMPLE TO OPERATE—One lineman can operate this 12-pound instrument—clamp it on a line and connect the simple voltage dividers. Then, while the instrument is still on the line, he can obtain readings of volts, amperes, and vars—simply by operating a selector switch. Furthermore, illumination of the scale permits accurate readings in poor light or at night.

Find out the facts about your lines with this new G-E varmeter—it can obtain measurements for you that heretofore involved great cost and labor. It will point out simply, accurately, and quickly how you can serve more pay load with your lines.

FOR FURTHER INFORMATION—Ask for our publication GEA-3294, which contains complete information. Call your nearest G-E office or write General Electric, Schenectady, N. Y.

HEADQUARTERS FOR ELECTRICAL MEASUREMENT

GENERAL ELECTRIC

430-150

NEW ENGINEERING IDEAS

Booster Holds Substation Voltage

By L. A. TERVEN
Technical Engineer
West Penn Power Company, Pittsburgh, Pa.

A bank of three 3,500-kva. transformers functioning as a booster maintains substation voltage at the same level whether the adjacent Connellsville power station is operating or not. The generating station may be called into service at short notice, and for that reason it is not practicable to change step-down transformer taps in the vicinity to accommodate change in bus voltage because of the reversal of regulation.

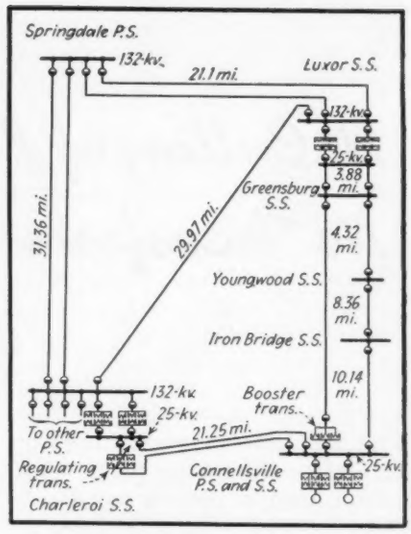
Connellsville power station of the West Penn Power Company has 55,500 kw. of steam capacity available for reserve for peak purposes. The station feeds into the secondary transmission network, which operates at the nominal voltage of 25 kv. When generating, the 25-kv. bus voltage must not go lower than 25.5 kv., in order to prevent generator instability due to high power factor. So the problem is resolved into maintaining about 25.5 kv. on the bus at times of no local generation, so that customers will not experience a change in voltage with the change-over.

It was found too expensive to tie the plant into the 132-kv. backbone transmission system. Intermediate transmission voltages of 33 kv., 44 kv. and 66 kv. were rejected as being inadequate, or too costly, or as entailing non-standard apparatus, and in all cases double transformation with attendant energy losses.

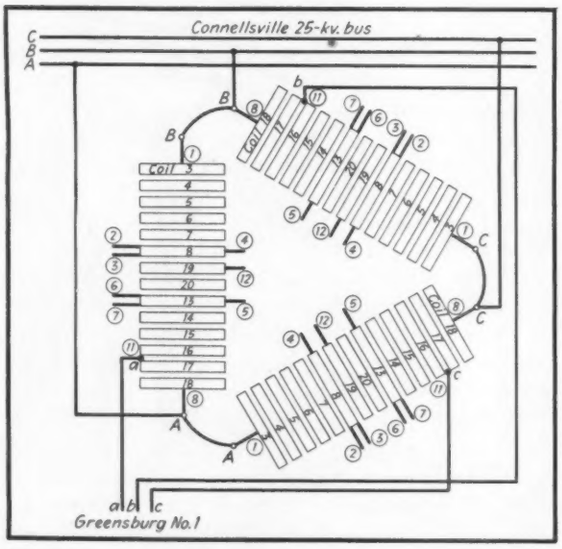
A 25-kv. regulating transformer of 10,000 kva. capacity was installed at Charleroi and about 7,000 kw. at 90 per cent was delivered to Connellsville over a 21-mile line which could be cleared of load taps. This same regulating transformer in the bucking positions serves to relieve Connellsville 25 kv. bus of high voltage conditions when the Connellsville plant is generating.

A 19,000-kva. generator at Connellsville is uncoupled from its prime mover and used as a synchronous condenser during times of off generation. Even so there were short periods of time when some additional kva. was required to avoid the use of expensive short time local generation for exclusive voltage regulation purposes.

It was finally decided to use three 3,500-kva., single-phase transformers adapted to serve as autotransformers delivering some 6,500 kw. at 100 per cent p.f. into Connellsville with 25.4 kv. on the bus side and some 20 kv. on the line side (from which the power comes). These transformers were secured from existing plant by making one or two changes, and as they are standard equipment, they will be available for service elsewhere if the occasion ceases for their present usage. A 25-kv. line from Greensburg to Connellsville was available for the feed.



Phase-angle advance prevents circulation of current over companion line from Greensburg to Connellsville



Booster's delta auto-connection prevents undesirable harmonics of the third series

Boost and phase angle controlled by tap connection as follows:

Turns, Connellsville Side	Turns, Greensburg Side	Net Boost, per Cent	Phase-Angle Advance	Connect Tap Number
334	283	27.8	9 Deg. 44 Ft.	4 to 5
343	292	23.6	9 Deg. 24 Ft.	2 to 12, 9 to 5
351	300	20.1	9 Deg. 8 Ft.	4 to 12, 9 to 6
360	309	16.4	8 Deg. 52 Ft.	3 to 12, 9 to 5
368	317	13.3	8 Deg. 37 Ft.	4 to 12, 9 to 5

LOOK WHAT I FOUND

NEW DELTABESTON SWITCHBOARD WIRE

. . . EASIER TO USE . . .

MORE DEPENDABLE

Here's a brand new Deltabeston Switchboard Wire—*and it's better than ever.* In the first place, over all diameter has been reduced. The wire is more flexible, installations are facilitated and wiring time can be cut.

But that's just the beginning! The NEW Deltabeston Switchboard Wire is insulated with a seamless tube of Flamenol synthetic. Panelboard service isn't interrupted by moisture, oil or humidity. Purified, Felted Asbestos is applied over the insulation to guard against the damaging effects of heat. An impregnated braid resists flame and abrasion.

JUST WHAT YOU WANT

You'll like the new Deltabeston Switchboard Wire—applaud its outstanding features. Flexible insulation won't crack or break. Dielectric strength is greater—*even on sharp bends.* A paper separator between copper and insulating wall permits clean stripping.

Today, send for complete information about Deltabeston Switchboard Wire. Find out how you can do *your* jobs easier—better—more quickly.

JUST WHERE YOU WANT IT

Deltabeston Switchboard Wire and a complete line of Deltabeston Asbestos-insulated Wires and Cables are distributed by General Electric Merchandise Distributors and Graybar Electric Company. Mail the coupon for a sample and a *fact-presenting* folder.

LOOK AT THESE FEATURES!

Smaller diameter
Faster stripping
Higher dielectric strength
Improved synthetic insulation
Purified Asbestos protection
Flame-proof braid
Approved by the Underwriters
Easy-to-use cartons

Section Y-91110,
Appliance and Merchandise Dept.
General Electric Company, Bridgeport, Conn.

I want FACTS about Deltabeston Switchboard Wire.
Send me the new folder and a sample length of wire—TODAY.

Name..... *Position*.....

City..... *Street*.....

GENERAL ELECTRIC

Load Meter as an Aid to Rating Utilization*

By K. J. FALCK
Electrical Engineering Division,
Philadelphia Electric Company

More efficient use of electrical equipment awaits new and improved methods for measuring normal and emergency ratings. Indicating ammeters, thermometers and even "thermal" ammeters are insufficient generally to permit full utilization of equipment ratings. The real answer to the problem appears to be a meter with the following characteristics:

1. To operate from current transformer secondary current by means of a heater coil.
2. Heat from the coil to act on a thermal element compensated for variations in ambient temperatures at the instrument. The ideal arrangement would be to have the meter ambient change the same as the equipment ambient, but this is not a generally practicable possibility, though it is used in the case of thermal relays mounted directly on a machine.
3. Purposely to have introduced thermal "storage" capacity. This capacity to be adjustable as to time and characteristics o that it can be calibrated to match the heating and cooling characteristics of the limiting equipment in the primary electric circuit.

The general idea is somewhat similar to that used for thermal load-indicating devices now applied to distribution transformers.

The method of operation of the load meter would be as follows:

Determine the continuous current-carrying capacity of the limiting equipment. This would vary with the ambient temperature, but a practical procedure would be to have one figure corresponding to the average summer ambient and one to the average winter ambient. A further refinement would be to have the temperature in the room where the limiting equipment is located act on the meter to adjust it for changes in ambient. Determine in the same way the emergency current which the limiting equipment is allowed to carry for the required time—for instance, four hours.

The load meter would have a zero point on the scale with scale divisions to the left and right, the zero point corresponding to normal rating. Scale divisions on the left would permit taking into account currents below normal; to the right on the scale would be a point corresponding to the emergency rating or danger point.

The instrument should be calibrated to indicate the normal rating for a continuous normal current, and following that to reach the emergency rating point in four hours if the emergency current is applied. In this manner an infinite number of actual current and time variations will be interpreted in terms of simple and safe operating limits.

*Adapted from paper submitted for James H. McGraw Award, 1939; all rights of republication reserved by author.

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Camera Photographs Electric Arcs

A fast camera devised by General Electric to photograph electric arcs, enabling engineers to study their behavior in circuit breakers and other electrical apparatus, is capable of taking 120,000 pictures per second.

The cylindrical-shaped camera, with a diameter of 14 in., is surrounded by a steel case large enough for a man to work in a dark room. Within the camera is a metal drum encircled by ten rows of holes so arranged that no two holes are exactly opposite each other, or come into photographic position at the same time. These holes, each 0.01 inch in diameter, are used instead of glass lenses, which distort the picture because of inter-reflection caused by the brilliant light of the arc. The film, 4½ x 40 in., is placed around the inside of the drum and held in position by centrifugal force. As the drum revolves each of the pinholes passes a slot, which extends the width of the film.

Fitting the film inside the drum

When the slot and hole coincide a picture is taken. The drum is driven by a ½-hp. motor capable of turning the drum at speeds as great as 7,200 r.p.m. and also acting as a dynamic brake to stop the drum after the film has been exposed.

The size of each of the 1,000 pictures taken with a single film is nine millimeters square, or about one-third of an inch on a side.

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Bare Conductors For Soil Heating

The use of low voltages applied to bare conductors makes soil heating safer, more efficient and less expensive. The choice of conductor, or resistance, is limited only by the space available since I^2R = Watts, no matter what conductor is used.

Cable makers manufacturing soil-heating cables to work at commercial voltages vary their methods of manufacture to insure a safely insulated job. Unless specified for the job, this class of cable is expensive because a system of watertight junction boxes is necessary, the installation of which requires highly skilled labor.

As described in *Electrical Review* the system of bare conductors becomes possible by stepping the voltage down to a value low enough to avoid appreciable leakage to earth. This is achieved by means of a transformer whose efficiency can be designed to be a substantial figure and whose mobility can be insured by limiting the size to suitable dimensions.

The advantages of using lead-covered wire as the conductor are chiefly because of its resistivity to soil and general weather deteriorative conditions, and it is almost worth its initial values if resold as scrap. Also, it is practically springless and forms into shapes readily, can be easily jointed and can be heated within a few degrees of its melting point without losing efficiency.

The initial expense, which depends on many factors, is found to be cheaper for bare conductors than for insulated ones.

No Sale!

Monitor Controller Company
BALTIMORE, MARYLAND
AUTOMATIC
MOTOR STARTERS AND CONTROLLERS

SALES AGENCIES
NEW YORK
CHICAGO
BOSTON
PITTSBURGH
ST. LOUIS
CINCINNATI
CLEVELAND
LOS ANGELES
SAN FRANCISCO
OTHER PRINCIPAL
INDUSTRIAL
LOCALITIES

FACTORY OFFICE
21 SOUTH GAY STREET
BALTIMORE, MARYLAND

SUBJECT
ATTENTION OF

BALTIMORE, MD.
September 21, 1939

Mr. Frank T. Ellis
Vice President & General Mgr.
Thomsen-Ellis-Hutton Co.
Gay & Water Sts.
Baltimore, Maryland

Dear Mr. Ellis:

Thirty to thirty-five years ago we had the pleasure of completely equipping the Summers Printing Company's plant with Monitor controllers. It was at the request of Mr. Summers, then President of that Company, that we developed the FIRST PRESET SPEED PRINTING PRESS CONTROLLER known to the industry.

A few years later we installed Monitor controllers throughout the Thomsen-Ellis plant. Your satisfaction with their service has been most gratifying to us.

Naturally when the heads of these two companies joined forces and formed a new organization, The Thomsen-Ellis-Hutton Company, we were interested. We felt that our motor control, through its steady, unfailing, year in and year out performance had contributed much to the growth of your two organizations, which growth finally culminated in a highly advantageous merger.

Frankly, we are hopeful that some of our control equipment has worn out by this time and needs replacement, and the financial advantage of the present merger may make possible the purchase of new control equipment. If we have proved to you that we know how to build electric motor control, may we look forward to an order from you in the near future?

Yours very truly,
MONITOR CONTROLLER COMPANY
C. R. Durling, Jr., Sales Mgr.

CRDjr:ECH

E. Thomsen, Pres. • Edward S. Hutton, Vice-Pres. & Director of Sales • Frank T. Ellis, Vice-Pres. & Gen'l Mgr. • Edward S. Hutton, Jr., Treas. •

THOMSEN-ELLIS-HUTTON COMPANY
A Combination of the Summers Printing Company and the Thomsen-Ellis Company
Creative Printers for Over Forty Years
WATER AND GAY STREETS, BALTIMORE, MD.
NEW YORK OFFICE, WOOLWORTH BUILDING

September 25, 1939.

Mr. C. R. Durling, Jr., Sales Manager,
Monitor Controller Company,
Gay and Lombard Streets,
Baltimore, Maryland.

Dear Mr. Durling:

We regret that we cannot give you a more favorable reply to your September 21st letter. You have certainly proved to us in the course of the past 35 years that you know how to build controllers that seemingly last forever. And right there lies your answer. Of all the equipment brought here from the Summers plant, NOT ONE PIECE of Monitor Motor Control needs replacement. And this is true after, and of all the equipment in our plant, as you mentioned in your letter, 30 to 35 years of daily service.

You may rest assured, however, that the next time we do need Automatic Electric Motor Control, we will specify Monitor.

Very truly yours,
THOMSEN-ELLIS-HUTTON COMPANY,
Vice President-General Manager.

FTE:MAK.

For controls that should last
Specify the kind that do!

Monitor
BALTIMORE, MD.
The Original
JUST PRESS A BUTTON System

Monitor UP TO 1200 Amperes Controllers

LOAD BUILDING

Roasters and Ovens at Niagara-Hudson

Steadily increasing customer acceptance of portable electric cookery units was indicated by salesmen's experience and sales volume during a recent six weeks' electric roaster campaign throughout the western division of Niagara Hudson system. Sales almost doubled those of 1938, the first year in which roasters were merchandised in the territory.

The company, to ascertain the price at which portable cooking equipment could be sold in volume, offered this equipment at prices ranging from $10.95 to $39.95. It was found that the medium-priced equipment selling between $20 and $25 was by far the most popular and easiest to sell.

During the campaign 598 portable appliances were sold, 64 of which were the new Universal electric oven and the remainder standard roasters of three manufacturers—General Electric, Westinghouse and Everhot. The General Electric roaster, which was featured in newspaper advertising, bill-inserts and other promotional mediums, was offered at a special price and the majority of units sold were this campaign roaster. An estimated 700-odd dealer sales of portable cookery appliances were also disposed of during the same period, given impetus by company advertising.

Company salesmen took part in the campaign—working on a base salary and 10 per cent commission on sales, and also competing in a Dress-Up Contest which carried with it many merchandise prizes. With each sale another article of wearing apparel was donned by the salesman and his supervisor, so that salesmen attaining their quota were completely dressed at the close of the drive. Others attended a wind-up outing clad in shorts, shirts and socks, some being minus trousers. Prizes consisted of purchase orders on a local clothing and haberdashery firm.

Economy Purchase Plan credit terms—for the most part about 10 per cent down and the balance in ten and twelve monthly payments with electric service bills—were found to be a great aid in closing roaster sales, according to salesmen participating in the campaign and contest.

Estimated annual consumption per roaster is 300 kw.-hr., with an estimated annual revenue for each unit of $6.59.

Buffalo Niagara Electric Corporation and Niagara, Lockport & Ontario Power Company, in Niagara Hudson's western division, propose to continue to merchandise portable electric cookery units, foreseeing even greater success in the future due to increasing national advertising space being devoted to this type of appliance and increasing customer receptiveness as householders become more familiar with the advantages of portable-style electric cookery.

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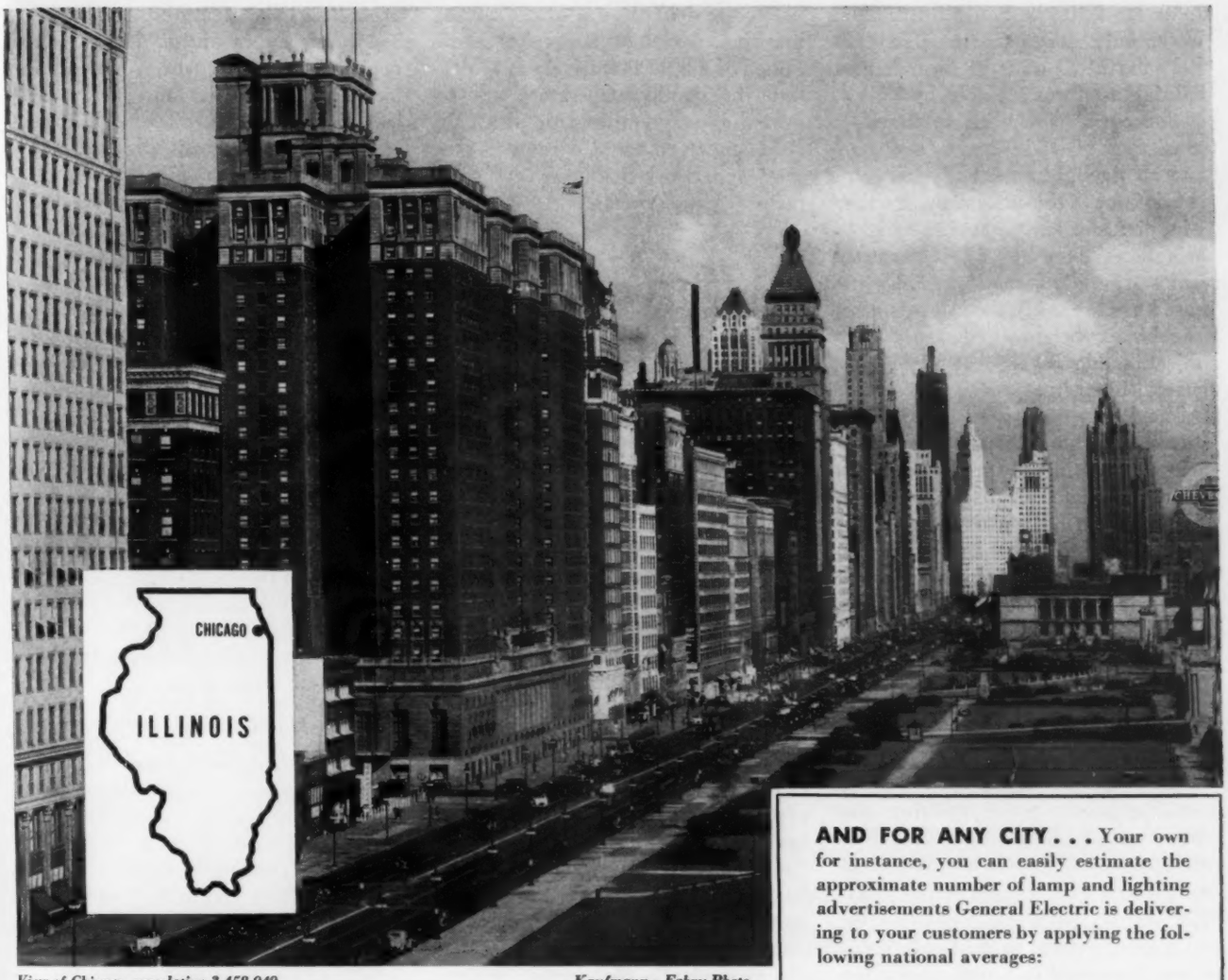
Six-fold Illumination at Double the Cost

From 5 to 30 ft.-candles, an increase of 500 per cent in illumination, with fluorescent lighting has increased the monthly lighting bill of

Courtesy of General Electric Company

Increasing illumination six-fold, from 5 to 30 ft.-candles, with fluorescent light doubles monthly bill. Lighting load increased from 1.97 kw. with incandescent to 7.5 kw. with fluorescent (including auxiliaries)



View of Chicago, population 3,458,949 *Kaufmann - Fabry Photo*

Selling lamps and lighting in CHICAGO, ILLINOIS

HERE'S the way General Electric advertising is constantly at work in Chicago, promoting light-conditioning for Better Light-Better Sight. Into Chicago homes every week goes a steady stream of G-E lamp and lighting advertisements amounting to 32 impressions per person in the last ten years.

IN 1939 . . . 8,580,000 magazines with General Electric lamp advertisements and 4,265,000 radio messages.

SINCE 1929 . . . 90,090,000 magazines with General Electric lamp advertisements.

LAST 2 YEARS . . . 5,890,000 Chicago newspapers with G-E lamp advertisements.

SINCE 1929 . . . 113,040,000 advertisements in magazines, newspapers, and radio . . . which is approximately 32 advertisements per capita.

G-E MAZDA LAMPS
GENERAL ELECTRIC

AND FOR ANY CITY . . . Your own for instance, you can easily estimate the approximate number of lamp and lighting advertisements General Electric is delivering to your customers by applying the following national averages:

Going into the average wired home in 1939

14 magazines with G-E lamp ads
5 newspapers with G-E lamp ads
5 radio messages
24 total advertising messages

• • •

In the last 10 years, the average wired home received

158 magazines with G-E lamp ads
30 newspapers with G-E lamp ads
20 radio messages
208 total advertising messages

John H. Witte & Sons, Burlington, Iowa, only 100 per cent. Early in 1939 the 1,970 watts of incandescent lighting used was replaced by 7.5 kw. of fluorescent (including auxiliaries), consisting of 186 30-watt and four 15-watt daylight lamps.

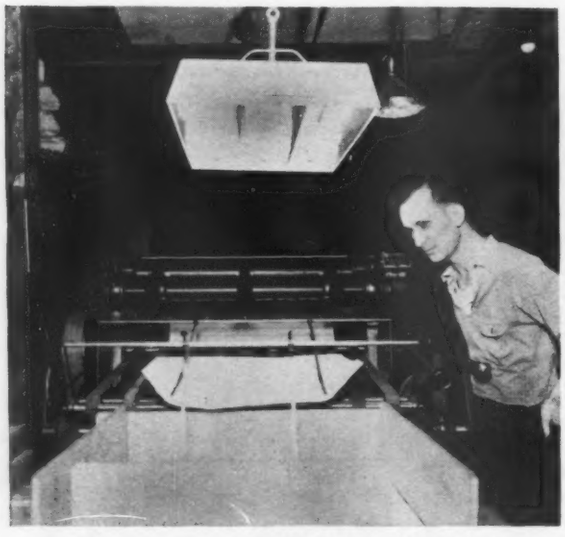
Contrary to the customary practice. 1-in. diameter lamps, having a higher brightness than the 1½-in. diameter lamps generally recommended for exposed use, were installed in this case. The higher brightness has not been objectionable because of the higher general intensity.

The lamps have been installed on standard wiring strip with the auxiliaries located in the strip. The lamps are on alternate circuits, half of them being on during the day, but all at night. To secure equal aging of lamps on the two circuits they are operated one day on and one off.

•

Watch Paper Delivery Under Fluorescent

When W. R. Ritchie & Company installed a new paper sheeting machine on which to cut paper into sheets from rolls the new unit was installed in a dark section of the plant. The seeing requirements were critical. Papers were of various colors and it was necessary to watch closely for fluctuations in color or defects in the paper as it was cut from the roll at high speed. After some experimenting, three 30-watt daylight fluorescent lamps were mounted about 24 in. above the delivery end of the cutting machine. About 60 ft.-candles is obtained of a light that is very near daylight in quality. Operators are reported as very enthusiastic about the light and company executives say quality of work has been very satisfactory.



Courtesy Commonwealth Edison Company

Ninety watts of fluorescent provides 60 ft.-candles of daylight in paper company

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Utility Keys Sales to Rate Reduction

Keying sales activity to three progressive rate reductions affecting the top block of the residential rate, Indiana General Service Company has initiated a company-dealer cooperative program which has as its slogan "Invest your electric rate savings in time-saving appliances." To date, with the campaign operating for five months, dealers have reported a material increase in sales of the specific appliances campaigned. This represents a 55 per cent increase in sales of the campaigned units over the same period in 1938.

This campaign, which is to be in effect throughout 1939, has three basic aspects: *To the customer* it offers an opportunity to purchase appliances at low prices, at the same time through the rate reductions securing low operating cost for the energy used. *To the electric dealers,* by presenting an unusually attractive residential rate and appliance bargains concurrently, the campaign offers an opportunity for securing sales volume by urging customers to invest their savings in appliances. *To the company* the campaign offers an opportunity through increased use of appliances to regain, in some degree, the revenue voluntarily surrendered and an equal opportunity to build public good will through assisting the customer to enjoy a more abundant life without increased cost.

Since the beginning of the campaign, in February, one appliance has been selected for special promotion each month. The company publishes one or more monthly ads, promoting the featured appliance. These ads appear in all local newspapers and aggregate 75 column inches in the dailies and somewhat less in the weeklies. They will supplement monthly ads dramatizing the rate reductions which will be 60 column inches in the daily press and somewhat less in weeklies. Dealers have co-operated in the publication of full-page ads, grouping their ads beside the company ad to increase effectiveness.

The company is providing dealers each month with displays featuring the appliance of the month and with streamers, pennants and giant reproduction of newspaper advertising. In addition, a prize of $20 is offered monthly for the best decorated window in dealers' stores featuring the appliance of the month.

Monthly meetings for dealers and distributors are being held by the company to sustain interest in the year-'round campaign.

Monthly Publicity

Leaflets describing the various monthly appliance campaigns are being distributed in quantities for distribution through meter readers, company solicitors and cashiers to keep customers reminded of each month's sale. Supplies of these leaflets are being furnished to dealers at no cost. It is being suggested to dealers that they supplement this material with direct mail circulars from their manufacturers for distribution by mail or to be handed out. Special signs on dealers' trucks and cars are also being provided.

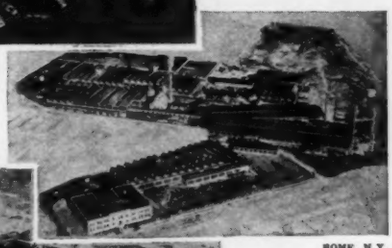
To the dealers who wish to put on additional sales people for house-to-house canvassing the utility is offering assistance in training groups of such people. Dealers are urged to use house-to-house canvassing for the reason that the campaign provides an opportunity for sales of appliances and wiring business beyond the appliance of the month.

In order to secure full attendance at the monthly dealer meeting the company offers attendance prizes to be drawn for by those who are present at the meetings. With dealers, distributors and manufacturers participating in the promotion and sale of appliances the Indiana General Service Company hopes to be able to attain a very substantial increase in load with the completion of the activity.

A Statement of Position and of Policy

BAYONNE, N.J.

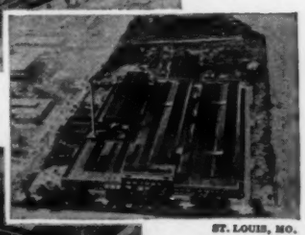
PERTH AMBOY, N. J.



ROME, N.Y.

BUFFALO, N.Y.

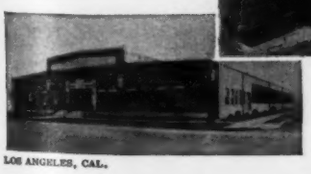
PAWTUCKET, R.I.



ST. LOUIS, MO.

EMERYVILLE, CAL.

BALTIMORE, MD.



LOS ANGELES, CAL.

With capacity demands on the production machinery of the wire and cable industry, General Cable finds itself in a strong position through multiple plants and exceptionally large manufacturing facilities.

As a matter of practice and policy it is protecting in every way possible its scheduled deliveries to those who look to General Cable for their normal needs.

In the handling of the surge of extra demand it proposes to follow the same policy, tempered only by priorities which must be recognized—and understood.

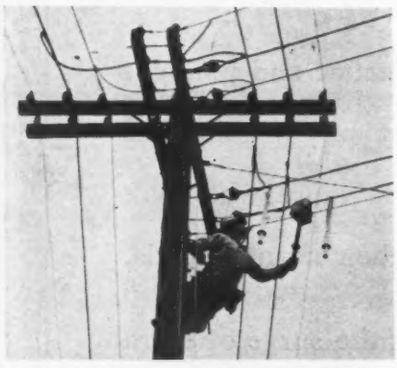
GENERAL CABLE

General Cable Corporation Sales Offices: ATLANTA • BOSTON • BUFFALO • CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DETROIT KANSAS CITY (MO.) • LOS ANGELES • NEW YORK • PHILADELPHIA • PITTSBURGH • ROME (N.Y.) • ST. LOUIS • SAN FRANCISCO • SEATTLE • WASHINGTON (D.C.)

NEW EQUIPMENT

Varmeter

This instrument employs an electrostatic wattmeter element and measures vars (reactive volt-amperes) on a single-phase basis by indicating the product of amperes and volts, and the sine of the angle between



Portable electrostatic varmeter, Type "AE-1," a 12-lb. instrument for use on distribution line determines current up to 300 amp., line volts, and reactive kva. on power lines. **General Electric Co.**, Schenectady, N. Y.

these quantities. Jaws of a split-core transformer, supplying the element with a voltage proportional to the line current, located on top of the varmeter may be latched open, the instrument hung on the line, and the latch tripped with an insulated stick. Voltage dividers, consisting of plastic tubes containing resistors, a small capacitor and neon lamp, are attached to the line by clamps and supply the definite fraction of line voltage. A range selector switch and adjusting knob must be set before actual readings can be obtained.

•

Flow Indicator

Rate of flow indicator "MJL No. 98," for indicating the flow of liquids, for balancing flows, for indicating rate of flow and liquid levels. **Morey & Jones, Ltd.**, 922 So. Hemlock St., Los Angeles, Calif.

When used as a flow indicator, this instrument is actuated by the differential pressure produced by a primary device such as an orifice, venturi tube, or pitot tube, inserted in the pipe line. The differential pressure is balanced by a calibrated bellows unit which moves in direct relation to the pressure applied, and thus transmitted to the pointer. The calibrated bellows unit eliminates the mercury column. It is said that it does not have to be accurately leveled and can be used where more delicate instruments would be thrown off adjustment. May be calibrated between 0–30-in. and 0–225 in. of water. Suggested applications include indicating rate of flow of cooling water and lubricating oils to bearings in prime movers, cooling water to condensers and transformers.

•

Motor

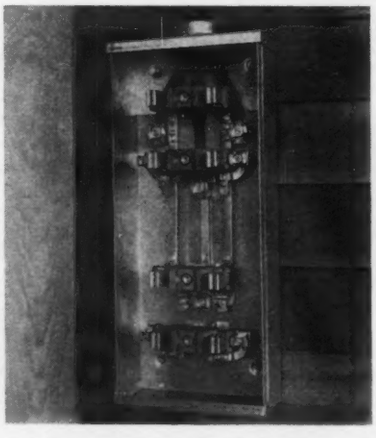
Type "KD" motor with output of armature shaft being approximately 1/10 hp. at 7,000 r.p.m. for a.c. and d.c. operation. **The Dumore Co.**, Racine, Wis.

A heavy-duty, double-reduction geared motor with a lower power winding than the other motors in the "K" series. The output shaft may be brought out horizontally to the left or parallel to the armature shaft. For use with stamping machines, transmission controls, welding machines, etc.

•

Meter Trough

These standard troughs are equipped with solderless connectors, the line side terminals taking all sizes of wire up to No. 4/0, load side up to No. 1/0 inclusive. A one-piece socket ring and bar is said to

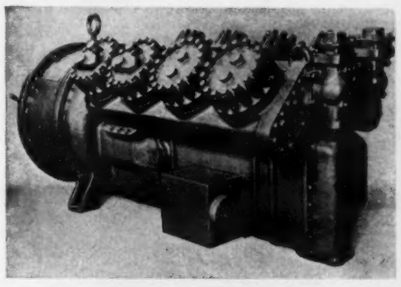


Outdoor weatherproof troughs for socket-type meters for vertical mounting "No. 5462." **Anchor Mfg. Co.**, Boston, Mass.

increase the strength and insure accuracy of meter mounting. A special safety stop on the cross-bar is claimed to avoid accidental shorting of line terminals when mounting or removing covers.

Air-Conditioning Compressor

Refrigerant-cooled motor features a new hermetically sealed air-conditioning condensing unit. New 90-deg., V-type unit is said to require but one-third the space and to be but two-thirds as heavy as conventional compressors for the same capacity. In addition, it is said to be 12 per cent more efficient. Size has been reduced by



V-type, 16-cylinder, 100-ton air-conditioning compressor; 100-hp., 1,150-r.p.m. driving motor, operates on 208, 220 or 440 volts, two or three phase, 60 cycles. **Westinghouse Electric & Mfg. Co.**, East Springfield, Mass.

using cold refrigerant gas returning from evaporator to cool driving motor, making it practical to tuck compressor in most readily available space without regard for ventilation to carry away heat losses of motor. Use of suction gas, even with extremely high atmospheric temperatures, is said also to prevent motor from overheating and thus tripping off line when needed. Starting is by line starter or by reduced voltage; capacitors added for high power factor applications.

•

Recorder Controller

Photo-electric recorder-controller for throttling electric heat; for a.c. 110 volts, 25, 50 or 60 cycles; chart speeds 1-, 2-, 3-, 4- or 6-in. per hour (adjustable). **C. J. Tagliabue Mfg. Co.**, Brooklyn, N. Y.

This control is designed for electrically heated furnaces or ovens so that heat input to the furnace varies inversely as temperature, with the per cent of "time-on" of power to the furnace. A beam of light reflected from the mirror galvanometer shines on the edge of the phototube screen, and, depending on its position with reference to the "controlling edge," the reversible motor driving the recording contact carriage is stationary or

—BUT WHEN THERE ARE MILLIONS IN THE AIR

—YOU CAN BE CERTAIN

THAT GOOD DAYS HAVE ARRIVED—
JUST AS MILLIONS OF HUBBARD
4-11-44 WIREHOLDERS IN USE ARE
POSITIVE PROOF OF THEIR QUALITY.

HUBBARD AND COMPANY

PITTSBURGH . . . OAKLAND . . . CALIFORNIA . . . CHICAGO

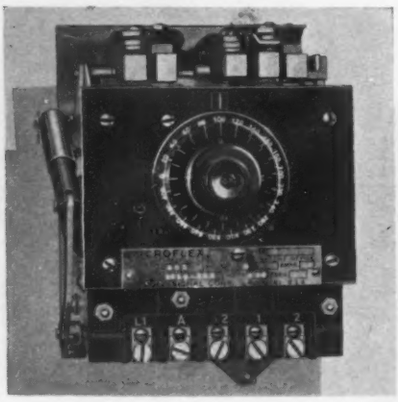
"HANG THE LOAD ON HUBBARD HARDWARE"

moves the carriage up or down the scale. Throttling regulation is obtained by reciprocating the contacts.

•

Counter

This counter is a relay for limiting the number of operations of a machine or part in a processing cycle, for use in control circuits of automatic machine tools and process controls where contacts are to be



Microflex instantaneous reset counter No. "HZ1," 10 amp., 110 volts a.c., 60 cycles. **Eagle Signal Corp.**, Moline, Ill.

closed for a predetermined number of operations. The actuating or impulse coil may be operated as fast as 1,000 times per minute, the company says. Available in all standard voltages and frequencies.

•

Trouble Lamp

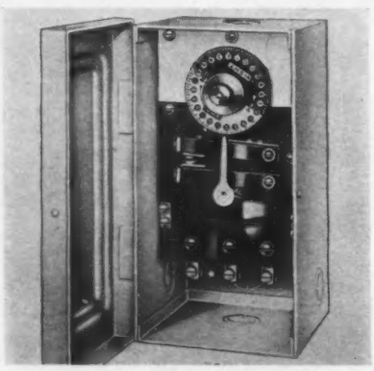
"Auto-Spot" trouble lamp, adjustable, up to 100 watts. **Eagle Electric Mfg. Co.**, Brooklyn, N. Y.

A two-piece reflector with a bayonet-locking feature for quick changing of the bulb makes this lamp practical for garages, auto mechanics, etc. Strain relief on the wire incorporated inside the socket is said to prevent wire pulling loose from terminals.

•

Time Switch

This electric time switch is for commercial, domestic, poultry farm and industrial use. A synchronous motor, self-starting, and with sealed-in lubrication, is claimed to have low-wattage consumption. A new quick make-and-break switch action, mechanically operated by the motor-driven



Electric time switch for automatically controlling electrical circuits for timed operations; 115 and 115-230 volts a.c. **Wadsworth Electric Mfg. Co., Inc.**, Covington, Ky.

clock movement, produces a "wipe-action" before contact is broken. Single-circuit single-pole, single-circuit double-pole and two circuits for use on alternating current only.

•

Circuit Breaker

Electro-magnetic non-thermal auxiliary circuit breaker for 110- and 220-volts a.c. in ratings up to 1 hp. and 35 amp. **Heineman Circuit Breaker Co.**, Trenton, N. J.

Because of its explosion-proof condulet this breaker finds use in paint factories, mines, refineries, chemical laboratories, graineries, distilleries, arsenals and other locations where fumes, acids, gases and dust are prevalent in the atmosphere. The breaker has magnetic instantaneous trip on short circuits and magnetic time delay on harmless overloads.

•

Meters

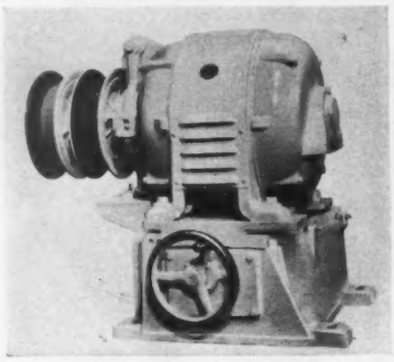
Meters for power plants and industrial processes. **Bailey Meter Co.**, Cleveland, Ohio.

This company announces the restyling of its complete line of meters. Durability has been increased by a steel ring welded to the meter casing which also serves as a support for the hinged door; a new sealing method keeps moisture and dust out, among other improvements.

•

Motor Belt

Speed changes on the unit are effected by turning the hand wheel which shifts the motor on the base, thus moving the yoke which actuates the pulleys. The belt may be tightened or loosened without shifting



Multiple belt for variable-speed drive motors. **U. S. Electrical Motors, Inc.**, Los Angeles, Calif.

the entire base by adjusting a set screw which turns the eccentric bushing located at the pivot point of the shifting yoke arm.

•

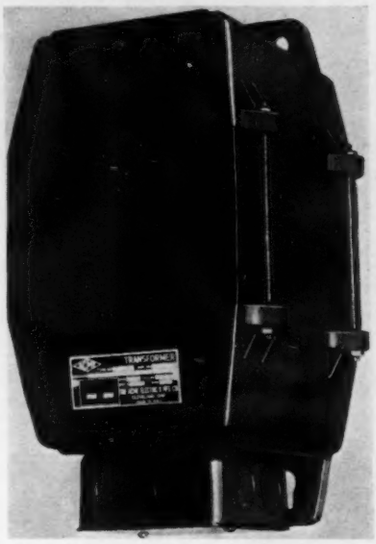
Sealed Bearings

Red seal bearing, "6200 RS"; a double felt seal bearing to single row widths for shafts up to approximately 1-in. in diameter. **SKF Industries, Inc.**, Philadelphia, Pa.

A new seal is claimed to exclude dust or dirt by a felt fibre contact on the polished surfaces of the inner race, and by utilization of the natural tendency of deflected felt to resume its original flat shape. Can be applied to bearings having a standard single row S.A.E. dimension of bore, inner and outer race width. Suitable over a great range of speed.

Transformer

The manufacturer claims high full load operating efficiency through design of full air draft external ventilation; specially



Air-cooled power transformers for lighting load distribution from a power line and for industrial applications; cover standard voltage characteristics from ¾ to 10 kva. **Acme Electric & Mfg. Co.**, Cleveland, Ohio

wound, hand-finished coils, insulated between layers with high dielectric strength insulating materials, and cores of thin gauge low loss steel.

•

Lamp Auxiliaries

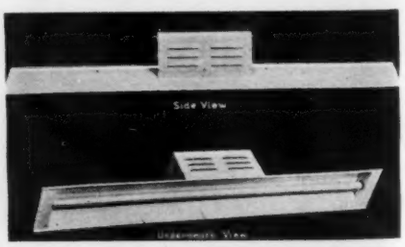
Fluorescent lamp starter and ballast; **Westinghouse Electric & Mfg. Co.**, Cleveland, Ohio, and **Bryant Electric Co.**, Bridgeport, Conn. Lamp starter, **General Electric Co.**, Bridgeport, Conn.

New fluorescent lamp starters consist of a replaceable switch and condenser unit, which are attached to a lamp holder. The ballast, a current limiting device, is designed for single and two-lamp operation. In the latter case the power factor is claimed to be corrected to approximately 0.95, and when lamps are adjacent much of the stroboscopic effect is said to be overcome.

•

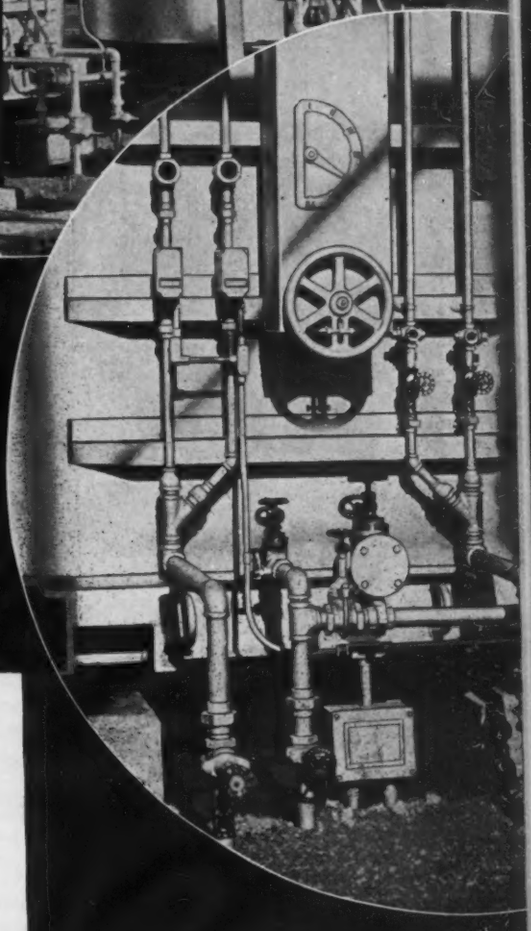
Lighting Unit

It is said that this unit has a fine light approaching true daylight, a large light output and a life of 5,000 hours. These lighting units find use in industrial and commercial applications such as stores, windows, displays, plants, warehouses, offices, etc.



Model "HC-10" with one tubular lamp or Model "HC-12" with two tubular lamps; 0.90 p.f.; 40 lumens per watt; lamp life 5,000 hours. Reflectors 58x8x8 in. **Flex-O-Lite Co.**, St. Charles, Ill.

3—10,000 Kva MOLONEY 110,000 volt, Single Phase, Water Cooled Transformers



You will agree

. . . that transformers, especially Power Transformers, should represent long-term investments. Economy in purchasing, therefore, depends upon the life of the transformers, together with their operating costs. These two factors are determined by the quality of design and manufacture. Moloney never sacrifices quality for the benefit of price. You can be certain that when you buy Moloney Transformers, you will get fine Performance along with real Economy. Moloney Electric Company, Saint Louis.

MOLONEY TRANSFORMERS

NEWS ABOUT PEOPLE

Edison G.-E. Announces Executive Appointments

Changes in the Hotpoint organization have recently been announced by R. W. Turnbull, vice-president and general sales manager, Edison General Electric Appliance Co., Inc.

Ward R. Schafer, who has been with the Hotpoint company for more than fifteen years, as commercial cooking equipment sales engineer, and later as manager of Hotpoint service department, has been made manager of the Hotpoint range division. Mr. Schafer is a graduate of Michigan State College and before joining the Hotpoint organization he was connected with the test department of the Commonwealth Edison Co.

G. H. Smith, Hotpoint refrigeration division manager, has been made general merchandising manager. His duties will include co-ordination of sales plans

W. R. Schafer

and activities of all Hotpoint products sales divisions. Since 1925 Mr. Smith has been engaged in every phase of selling, retail department store, factory representative, sales manager and equipment specialist, with a number of organizations.

Moffett Studio

G. H. Smith

F. B. Williams, Atlanta district manager, has been made manager of the Hotpoint refrigeration sales division, with headquarters at Chicago. H. K. Dewees, Hotpoint Minneapolis district manager, has been appointed sales manager of the Atlanta district.

D. C. Marble, Hotpoint range division manager, has been appointed manager of the Hotpoint product service division, directing product service for all five Hotpoint home appliances.

A. Rebensburg has been appointed manager of the merchandising research and statistical division.

•

▶ WALTER C. HERBERT has been named director of the electrical utilities division of the South Carolina Public Service Commission, succeeding L. W. Pollard, who resigned to engage in contracting engineering. In 1932 Mr. Herbert was appointed by the commission to the position of assistant valuation engineer, and since then his promotions have been rapid and before his recent elevation to the responsible position of director he had served as assistant director of the electrical utilities division for two years.

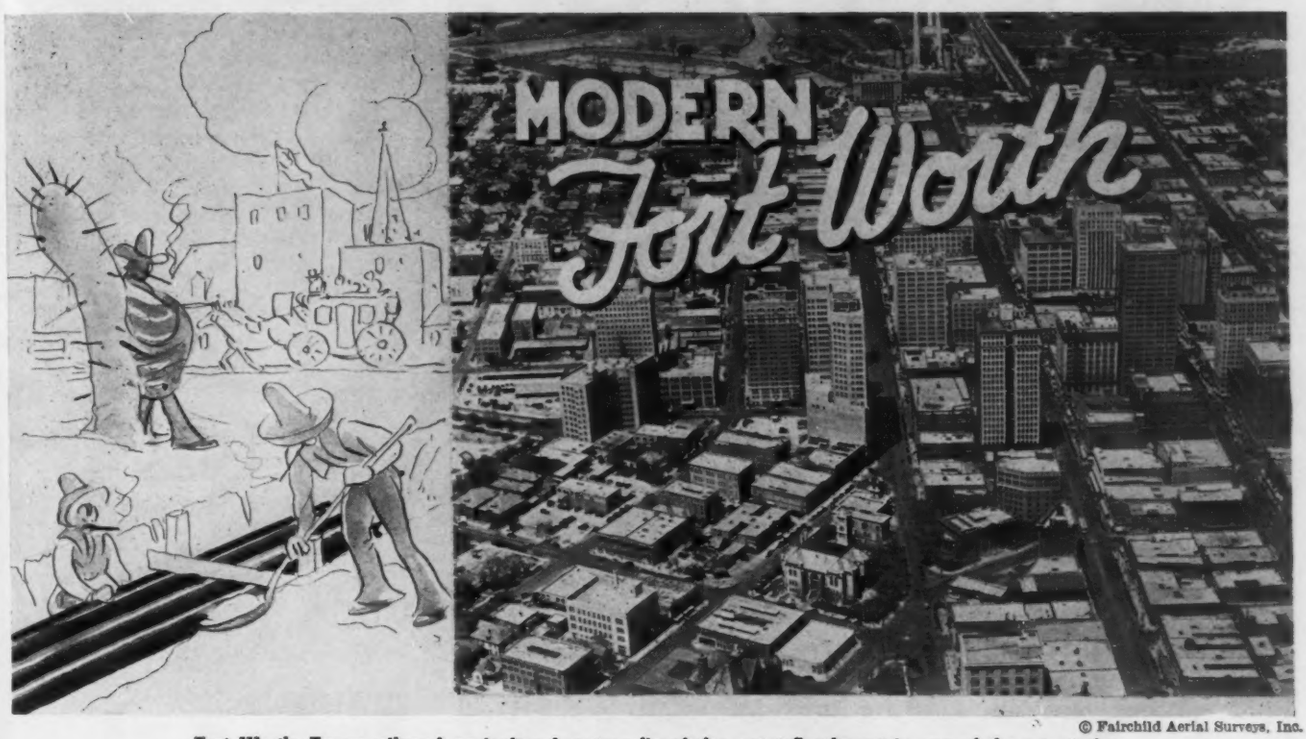
Longley Remains With Commonwealth & Southern

J. A. Longley, formerly vice-president and general manager of the Tennessee Electric Power Co., has been appointed as assistant to Walter H. Sammis, vice-president of the Commonwealth & Southern Corp.

Mr. Longley entered the public utility field in 1910 with the Portland (Ore.) Railway, Light & Power Co. on the design and as erection superintendent of steam-electric plants. Three years later he was transferred by E. W. Clark & Co. to Columbus, Ohio, on the design of a new steam plant to replace the old plant damaged by Ohio floods of that year. In a short time he was again transferred to Nashville, Tenn., in connection with the design and improvements of the Nashville steam plant. From 1914 to 1921 he served as assistant superintendent of

the Tennessee Power Co., working on engineering and operating problems on both steam and hydraulic plants. He then became general superintendent of the Tennessee Power Co., and at the consolidation of several properties forming the Tennessee Electric Power Co. Mr. Longley was made manager

ORANGEBURG HAS *long* BEEN PART OF



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Fort Worth, Texas, oil and agricultural metropolis of the great Southwest is one of the country's truly modern cities. For many years a consistent program of efficient underground distribution has been followed and contributes to Fort Worth's outstanding metropolitan position for its size. Fort Worth "underground" is principally "ORANGEBURG".

NOCRETE
for
"SERVICES"

ORANGEBURG NOCRETE enables a larger "service" raceway for less cost, thus obviating one of the hurdles of future load building.

Another of the
"ORANGEBURG
Points
that count."

The Orangeburg trademark is a guarantee of the best of Fibre Conduits, a time-tested, enduring "service" of cable protection *wherever electrical raceway facilities are to be installed underground.*

● A modern metropolitan oasis in the "wide open spaces" Fort Worth has been endowed with a plentiful supply of "common labor". Under circumstances this might be a handicap to best conduit installation. ORANGEBURG, however, because of its basic simplicity of installation, requires no especial skills or tools, eliminates problems of field engineering.

Light weight makes for ORANGEBURG's easy handling, tough strength enables it to withstand hard usage and highest quality special materials assure decades of trouble-free service.

For installation underground with CONCRETE ENCASEMENT: ORANGEBURG *STANDARD* FIBRE conduit is recommended for duct banks (4 ducts and over), main distribution, high tension and "downtown" locations.

For installation WITHOUT CONCRETE ENCASEMENT: the ORANGEBURG dual-economy NOCRETE conduit is recommended for service entrances, extensions, parkways, and street lighting, suburban distribution, laterals, signal systems, etc.

Sales Agent—Distributors

GENERAL ELECTRIC SUPPLY CORP. **GRAYBAR ELECTRIC COMPANY INC.**

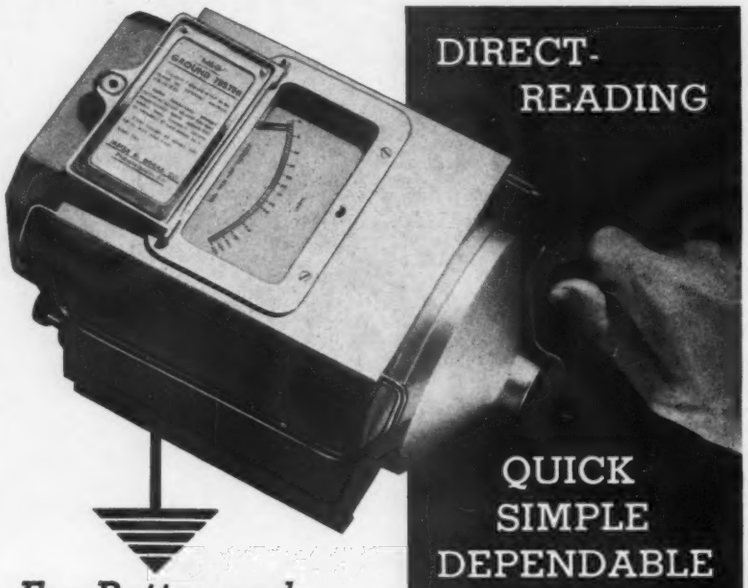
MADE AT ORANGEBURG, NEW YORK
BY THE FIBRE CONDUIT COMPANY
292 MADISON AVE. NEW YORK CITY

ORANGEBURG ***Standard*** **for installation** ***with*** **concrete encasement**
NOCRETE for installation ***without*** **concrete encasement**

"MEGGER"

TRADE MARK REGISTERED U.S. PAT. OFF.

GROUND TESTER



DIRECT-READING

QUICK
SIMPLE
DEPENDABLE
RUGGED

For Better and Safer Grounding

"I do not see how anyone who is seriously interested in his grounding problems can afford not to use these instruments."

Such, in substance, is what we are told repeatedly by utility engineers who have *lived* with grounding problems and who know whereof they speak.

When you consider the amount of money that is invested in your electrical equipment, and the time and energy required for making necessary tests, it is obviously good economy and wise precaution to purchase testing instruments that combine high quality with maximum simplicity of operation.

Today, users of our direct-reading "Megger" Ground Testers have *fewer grounding troubles*, because of the indispensable service which these instruments have rendered.

We shall gladly forward our Technical Bulletin on Ground Testing, No. 1285-W, which contains valuable information on the subject, including details about the "Megger" Ground Testers. Write for a copy.

JAMES G. BIDDLE CO.

ELECTRICAL INSTRUMENTS

1211-13 ARCH STREET PHILADELPHIA, PA.

of production and transmission, with supervision over all generating plants, transmission lines, substations, etc. From 1928-1934 he was assistant to the vice-president and general manager. In 1934 he became vice-president and general manager.

For several years Mr. Longley was a member of the national committee of inductive co-ordination of the National Electric Light Association. He was a member of the original operating committee of various power companies and for several years worked in connection with interchange of power and pooling power resources by the several southeastern power companies, both affiliated and non-affiliated, which were involved.

•

Charles T. Lawson Joins Nash-Kelvinator Corp.

Charles T. Lawson has been appointed sales manager of the household division in charge of all Leonard and Kelvinator household products, Nash-Kelvinator Corp. Mr. Lawson, who

until recently was household sales manager of the General Motors Frigidaire division, will have charge of all Kelvinator and Leonard refrigerator, electric range, electric water heater, washing machine and ironer sales.

Mr. Lawson has been identified with the electric appliance business for more than 20 years.

•

▶ JOSEPH B. ELY, former Governor of Massachusetts, has been elected a director of the International Hydro-Electric System, succeeding Redfield Proctor, formerly Governor of Vermont, who has resigned because of ill health. Governor Ely has also succeeded Governor Proctor as one of the three trustees to whom the Class B and common shares of International Hydro-Electric System, formerly held by International Paper &

From Locomotive Headlight Wire to SERVICE ENTRANCE CABLES

OVER 60 TYPES OF ROEBLING ELECTRICAL WIRES AND CABLES

Power Cables: Paper; Cambric; Rubber

Parkway Cable

Police-Fire Alarm Cables

Service Entrance Cables

Network Cables

Magnet Wire

Rubber Covered Wires and Cables: Code; Performance; and Heat Resisting; Plain Rubber 60% sheath Power Cable, and 40% or 60% sheath Flexible Cords

Slow-Burning Wires and Cables

Bare and Weatherproof Wires and Cables

Submarine Cables

Appliance Cords

And a wide variety of other wires and cables, either Standard or to Customer's Specifications

QUICK SHIPMENT

Prompt Service is available at all offices and warehouse points listed below, where large stocks of a wide variety of standard Roebling Wires and Cables are always on hand. Your request for information, prices or samples will be welcomed.

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TRENTON, N.J.

Atlanta, Boston, Chicago, Cleveland, Los Angeles New York, Philadelphia, Portland, Ore., San Francisco, Seattle. Export Dept., New York

IF IT'S ELECTRICAL WIRE OR CABLE **ROEBLING** HAS IT!

RADIO-NOISE CAN'T HAPPEN HERE

BECAUSE . . .

Thomas "Quiet-Type" Porcelain Insulators guarantee positive and permanent protection from insulator radio-noise.

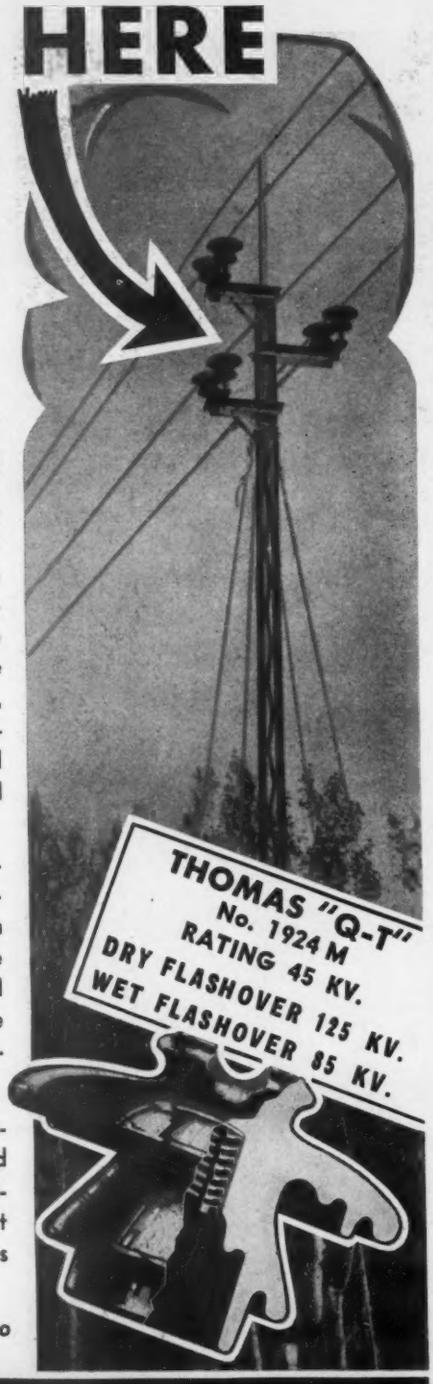
Manufactured exclusively by "THOMAS", using the patented "Thomas Process", they represent the most modern development in Ceramic Engineering for the elimination of radio interference at the insulator. Many thousands are now giving unexcelled noise-free service on major transmission and distribution lines.

The "Thomas Process" consists of ceramically bonding to critical areas of the insulator a metallic oxides "coating" which damps out noise effects emanating from the insulator in operation. In the regular "firing process" this becomes a unified and permanent part of the insulator itself and is as lasting as the porcelain. Being glaze covered by the same glaze which covers the insulator, the oxides "coating" is permanently protected from all atmospheric, climatic and weather conditions, from electrolysis and abrasion.

All Thomas "Quiet-Types" have a permanent glaze marking "Q-T" which distinguishes them in appearance from conventional types, since the oxides are barely discernible as they are covered by smooth glaze. "Quiet-Types" are obtainable in Pin Types — Suspension-Strain — and Switch or Bus Insulators.

Future lines will be judged by the unexcelled noise-free performance established by Thomas "Quiet-Types" today. Modern line construction demands the best in noise-free design — Specify Thomas "Q-T" Insulators.

More details in: "The Answer on Radio Interference". Ask for your copy.



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GRAYBAR ELECTRIC CO., INC., Agents

The Pioneer Since 1873

OUR 66TH YEAR

Power Co., have been transferred. These trustees were appointed under a plan which divorced International Paper & Power Co. from control of any public utility operating companies and contemplates the sale of its interests in such companies.

▶ BERNARD F. WEADOCK has announced the opening of an office for the general practice of law in Suite 4212, Sixty Wall Tower, New York. Mr. Weadock resigned as vice-president and managing director of the Edison Electric Institute last June. He had been associated with the institute since it was organized in 1933, when, as counsel for the public utilities in the Federal Trade Commission investigation of the electrical industry, he was drafted into the position of managing director on an emergency basis to guide the institute through its formative period. He practiced law in Michigan, his native state, before coming to New York City in 1924, where he became a member of the firm of J. C. and B. F. Weadock, specializing in corporation law. In 1928 he was chosen as special counsel to represent the utility associations in the Federal Trade Commission investigation of the electrical industry.

▶ J. WALTER MARQUARDT, a native of Illinois and rural service engineer on the staff of the State Rural Electrification Committee since 1936, has been appointed executive secretary of the committee, according to an announcement by Director J. H. Lloyd of the State Department of Agriculture. Mr. Marquardt succeeds WARREN H. MARPLE, who resigned to take a position as rural marketing specialist with the Bonneville power project at Portland, Ore. Director Lloyd said the state committee selected Mr. Marquardt on the basis of his long experience in the electrical field and his service on the state committee staff for more than three years, during which time he has been in close contact with all rural electrification developments in the Illinois field. Mr. Marple, who has gone to the Bonneville project, had served as executive secretary of the committee since its organization in 1936.

▶ WARREN H. MCBRYDE, consulting engineer and industrialist of San Francisco, Calif., has been elected president of the American Society of Mechanical Engineers. A native of Alabama, Mr. McBryde specialized in electrical and in mechanical engineering at Alabama Polytechnic Institute, Auburn, from which he was graduated in 1897. After serving in the Spanish-American War he went west, and from 1899 to 1903 he was employed by the Yuba Electric Power Co., San Francisco, and by the Bay Counties Power Co., also of San

MACALLEN MICA

The reliability of Macallen Mica is brought to the greatest possible usefulness by the forty years of specialized skill and experience of Macallen processing—the precise and complete answer to every insulating problem.

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COMPRESSED SHEET · MICA PAPER, CLOTH, TAPE · HEATER PLATE · COMPRESSED SHEET TUBING
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For Accurate Control of VOLTAGE LIGHT HEAT POWER

VARIAC Autotransformers

18 Money-Saving Models—170 watts to 23 kw—for better performance—smoother operation—higher efficiency

● VARIAC Autotransformers provide many advantages not found in any other manually-operated voltage control. The VARIAC is especially useful for

- Wide Range Calibrations
- Performance Tests on Equipment at above and below line voltage
- Acceptance Tests on Apparatus
- Building up High Voltages for insulation and dielectric tests
- Smooth control of d-c voltage from grid-controlled rectifiers
- Testing variable-speed motors

FEATURES include: exceptionally good regulation — output voltages substantially independent of load; smooth control in stepless increments *from zero*; output voltages *higher* than line voltages; small temperature rise; rugged construction; calibrated dials.

THOUSANDS of VARIACS are in use throughout the electrical industry in any application when the control of a-c voltage is desired. VARIACS have the *smoothness* of a rheostat with the *efficiency* of a transformer.

For Breakdown Tests the VARIAC is used in the primary circuit of power transformers to vary the voltage gradually on transformers, condensers, insulation, oils and other materials.

WRITE FOR ILLUSTRATED BULLETIN 499 FOR COMPLETE DATA

GENERAL RADIO COMPANY
CAMBRIDGE, MASSACHUSETTS

Francisco, as chief draftsman and assistant to the chief electrical and mechanical engineer. Subsequently he was associated with the Du Pont interests for a number of years and later with the California & Hawaiian Sugar Refining Co. In 1927 he established his present business as a consulting engineer. Mr. McBryde for a number of years has taken a deep interest in the affairs of the A.S.M.E. Included in his other activities is the San Francisco Electrical Development League.

► A. L. SCAIFE, for several years in charge of the advertising and promotion of General Electric refrigerators and other products of the company's specialty appliance division at Cleveland, has been appointed assistant advertising and sales promotion manager of the General Electric appliance and merchandise department. The appointment places Mr. Scaife specifically in charge of planning for the entire appliance line. He will make his headquarters in Bridgeport, Conn.

► R. W. BECK, formerly an executive with the Bonneville project, has been appointed as consulting engineer by the Klickitat County, Wash., public utility district. Mr. Beck will make a survey of the property owned by private utilities in the county.

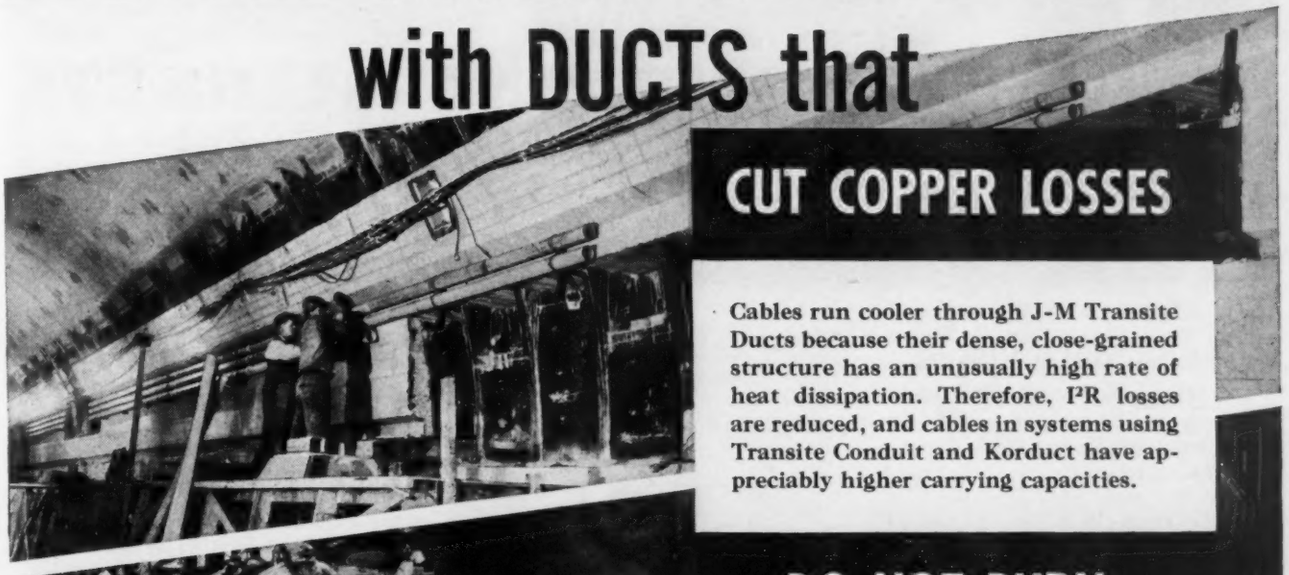
OBITUARY

► SYDNEY EVERSHED, well-known British electrical testing instrument manufacturer, died at his London home late in September. He had been in the electrical instrument trade for more than half a century. Mr. Evershed's name is especially associated with the development of instruments for testing electrical insulation. Out of his experiments developed the Evershed insulation testing set, which became the precursor of a long series of instruments known as Meggers, for testing the adequacy of the insulation of electrical installations. With a group of associates he organized in 1895 the firm of Evershed & Vignoles. He gave up his position as managing director in 1924, but remained chairman until his retirement last year.

► WALTER D. ADAMS, dealer contact department manager of the Memphis Light, Gas and Water division, Memphis, Tenn., died in that city October 9, in his 53d year. Mr. Adams joined the old Merchants Power Co. in Memphis as a salesman and later advanced to the position of sales manager of the Memphis Power & Light Co. When the dealer contact department was created several years ago he was made its head.

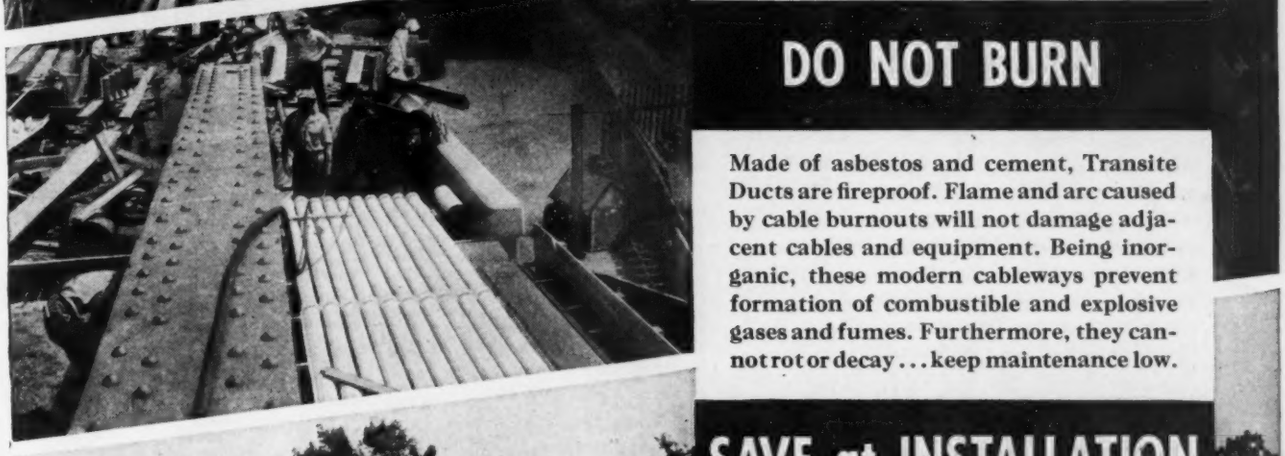
DISTRIBUTION COSTS LESS

with DUCTS that



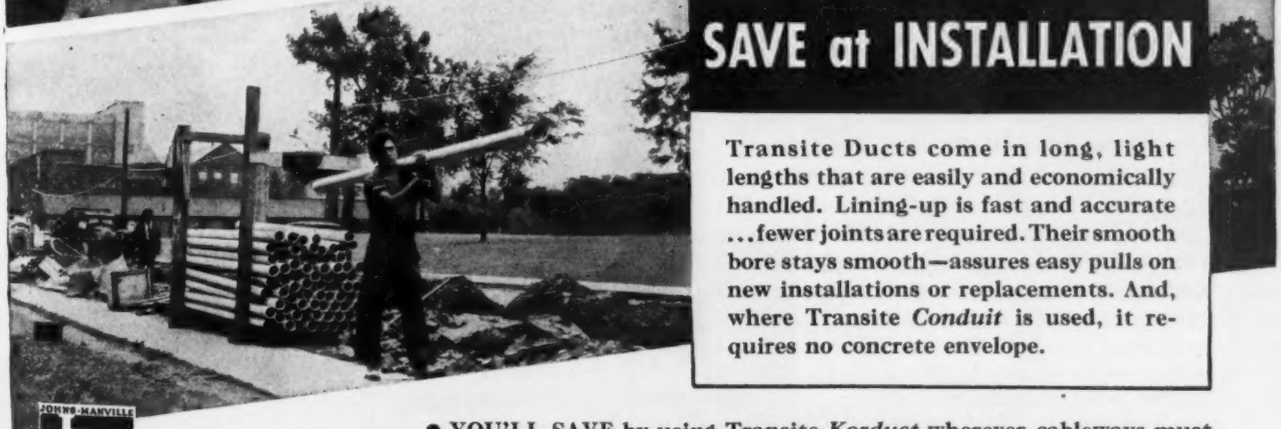
CUT COPPER LOSSES

Cables run cooler through J-M Transite Ducts because their dense, close-grained structure has an unusually high rate of heat dissipation. Therefore, I^2R losses are reduced, and cables in systems using Transite Conduit and Korduct have appreciably higher carrying capacities.



DO NOT BURN

Made of asbestos and cement, Transite Ducts are fireproof. Flame and arc caused by cable burnouts will not damage adjacent cables and equipment. Being inorganic, these modern cableways prevent formation of combustible and explosive gases and fumes. Furthermore, they cannot rot or decay . . . keep maintenance low.



SAVE at INSTALLATION

Transite Ducts come in long, light lengths that are easily and economically handled. Lining-up is fast and accurate . . . fewer joints are required. Their smooth bore stays smooth—assures easy pulls on new installations or replacements. And, where Transite *Conduit* is used, it requires no concrete envelope.

JOHNS-MANVILLE JM PRODUCTS

● YOU'LL SAVE by using Transite *Korduct* wherever cableways must be "concreted-in." On open and exposed locations, Transite *Conduit* is so durable it requires no protective casing. For full details, ask for brochure D. S. 410. Johns-Manville, 22 East 40th Street, New York, N. Y.

Johns-Manville TRANSITE DUCTS

TRANSITE CONDUIT for use underground without concrete envelope and for exposed locations — **TRANSITE KORDUCT** for installation in concrete

MANUFACTURING - MARKETS

Westinghouse Shows Sharp Rise in Net

Net profit for Westinghouse Electric & Manufacturing Co. for the third quarter this year rose 59.5 per cent over the same 1938 period, totaling $2,731,023, equal to $1.02 a share on combined preferred and common stocks, as compared with $1,712,221, equal after preferred dividend requirements, to 63 cents a common share in the same 1938 period.

Indicated net profit for the first nine months was $9,069,810, equal to $3.39 a share on the preferred and common stocks, as compared with $6,212,823, equal after preferred dividend requirements to $2.31 a common share.

The company reported net earnings of $773,841 in July, $853,045 in August and $1,104,137 in September.

Adjusted compensation of 4 per cent will be paid to all employees for October. Approximately 44,000 employees will receive this extra compensation.

Eleven Westinghouse executives started a tour of three Middle West states this week to ascertain, according to A. W. Robertson, chairman, how the electrical industry can increase its contribution to agricultural and industrial development of the Middle West. Arriving in Chicago from Pittsburgh, the itinerary also includes Minneapolis, Kansas City and St. Louis.

"At a time when we are beginning to be flooded with inquiries and orders stimulated by war," Mr. Robertson said, "Westinghouse executives have thought it particularly advisable to check with their regular customers to make certain that their welfare is not neglected while the company is looking after new business."

Included in the group, besides Mr. Robertson, are Frank A. Merrick, vice-chairman; George H. Bucher, president; Ralph Kelly, vice-president; Marvin W. Smith, vice-president in charge of engineering; L. W. Lyons, treasurer; Andrew H. Phelps, general manager of purchases and traffic; Harry F. Boe, manager of services; Bonnell W. Clark, president of Westinghouse Electric Elevator Co.

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Electric Contracts Let by Federal Agencies

Several electrical supply contracts have recently been awarded by Federal agencies:

General Electric Co., Navy, electric cable, $14,205; Government Printing Office, circuit breakers, $16,265.

Westinghouse Electric & Manufacturing Co., War, generator, $24,452.

Phelps Dodge Copper Corp., Navy, electric cable, $14,473.

Rockbestos Products Corp., New Haven, Conn., Navy, electric cable, $14,961.

•

Awards Line Contract

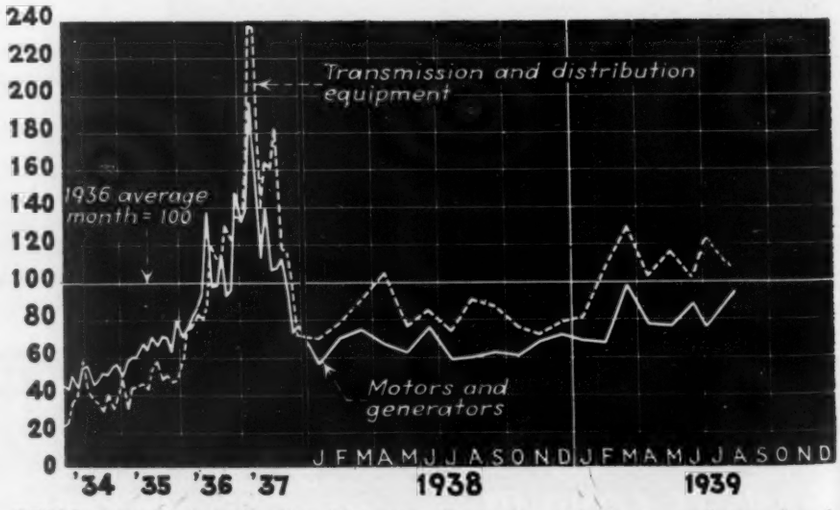
The Miller Construction Co., Inc., has been awarded a contract for the construction of the Lenore-Newcastle, Ind., 132-kv. steel tower transmission line by the Dresser Power Corp. The line is 41 miles long.

Electrical Machinery Orders Show Increase

Values of orders received for electrical goods in August show divergent trends as to the several classes. The index number for motors and generators, as announced by NEMA, rose 18.3 points over the preceding month to 94.3, representing a rise of 24.1 per cent. In contrast, the index for transmission and distribution equipment dropped 13.1 points to 108.1, the decrease amounting to 10.8 per cent in value of orders received.

Both groups continue to show strong gains over 1938, although the percentages have varied rather widely from month to month. The August index for motors and generators is 56.6 per cent higher than it was a year ago, whereas in July it was only 18.5 per cent.

Month	Motors and Generators		Transmission and Distribution	
	1939	1938	1939	1938
January	69.2	57.4	81.0	70.2
February	67.8	70.8	108.3	79.3
March	99.3	74.7	129.1	91.4
April	77.5	66.6	103.0	105.4
May	77.5	62.5	117.2	77.3
June	87.8	76.0	102.0	84.7
July	76.0	59.1	121.2	73.0
August	94.3	60.2	108.1	90.8



N.E.M.A. index, value of orders for motors (large d.c., polyphase, synchronous) and generators (engine, belt-driven); for transmission and distribution equipment

Manufacturers Make Sales Assignments

Electrical manufacturing companies have recently made the following appointments to their sales staffs:

CUTLER-HAMMER, INC., has announced that H. E. Ankeney has been appointed to take charge of the company's Indianapolis territory. Mr. Ankeney became acquainted with the manufacture, production and practical application of the company's equipment in the engineering and sales departments in Milwaukee. In recent years he has been associated with the Chicago office.

KELVINATOR DIVISION, Nash-Kelvinator Corp., has announced the appointment of E. R. Legg as Western sales manager of all Leonard and Kelvinator household appliances and of C. J. Bachman as west coast sales manager in charge of all Leonard and Kelvinator interests, both household and commercial.

•

Gets Maritime Contract

Cutler-Hammer, Inc., has received a $125,000 order for control equipment for five cargo boats being built by the Federal Shipbuilding & Drydock Corp., Kearny, N. J., for the United States Maritime Commission. The electrical apparatus will be used to operate pumps, fans, cargo winches, steering gear and similar apparatus.

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Lets Contract for Turbine

Columbia City, Ind., Board of Works has awarded contracts for a new 2,500-kva. turbine and condenser for its municipal power and light plant to the Westinghouse Electric & Manufacturing Co. on a bid of $63,710 for the turbine and $28,967 for the condenser and auxiliary equipment.

•

Apex Runs at Capacity

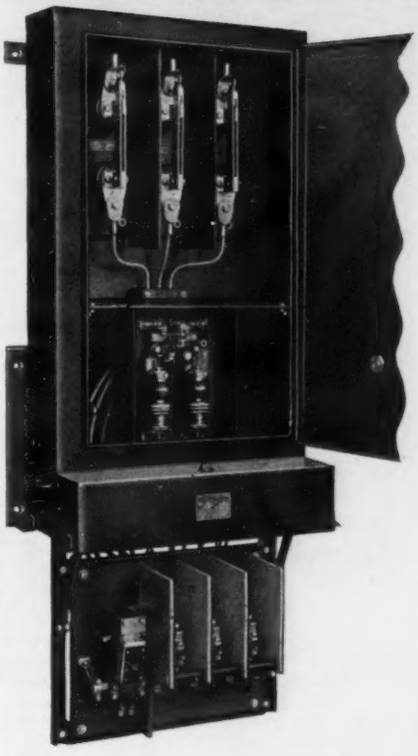
Operations of the Apex Electrical Manufacturing Co. are running practically at capacity, C. G. Frantz, president, has announced. Mr. Frantz said September usually has been a good shipping month for Apex and indications are that September shipments closely approximated shipments in September, 1937. Prospects for October are also good, it was stated.

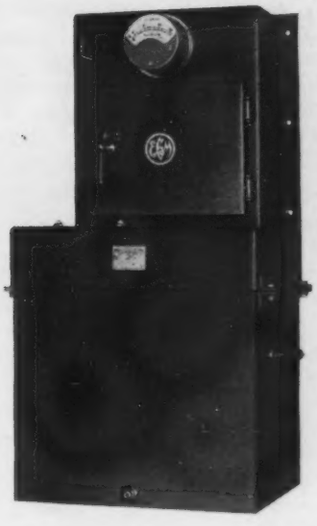
New York Metal Prices

	Oct. 17, '39 Cents per Pound	Oct. 10, '39 Cents per Pound
Copper, electrolytic	12.50*	12.50*
Lead, Am. S. & R. price	5.50	5.50
Antimony	14.00	14.00
Nickel, Ingot	35.00	35.00
Zinc, Spot	6.89	6.89
Tin, Straits	55.00	55.00
Aluminum, 99 per cent..	20.00	20.00

*Delivered Connecticut Valley.

NEW Design
OIL-IMMERSED
WALL MOUNTED STARTERS
FOR 2300 VOLT MOTORS
BY Electric Controller





These new type LZH Starters are particularly well suited for steel mills, oil refineries, grain elevators, cement mills and similar applications.

The illustration at the left shows a NEMA Type 1 enclosure with drop-oil-tank installed in an oil refinery. It has self-contained disconnect switches, safety door interlock and reset button on outside of door for resetting overload relays by operator.

The view at the right shows a NEMA Type 1-A enclosure with gaskets on overload relay door with oil-tank sealing against gaskets, for cement mill application—self-contained ammeter indicates the load on the motor at all times.

Mail coupon below for Booklet No. 88 describing EC&M Starters for motors of 110 to 2300 volts. Fill out and send to-day.

THE ELECTRIC CONTROLLER & MFG. CO. EC&M CLEVELAND, OHIO

HEAVY DUTY MOTOR CONTROL FOR CRANES, MILL DRIVES AND MACHINERY • BRAKES • LIMIT STOPS • LIFTING MAGNETS AND AUTOMATIC WELD TIMERS.

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Gentlemen:
Please send me a copy of Illustrated Booklet No. 88 describing EC&M 110 to 2300 volt Motor Starters.

Name.....

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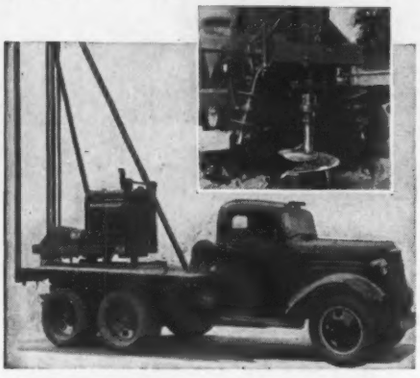
Include a
BUDA-HUBRON
Pole Hole Drill
in your 1940 Budget



Close-up of drilling mechanism, and truck mounted unit with pole setting derrick in place.

DON'T let your pole line installation and maintenance work do without this modern drilling machine any longer—be sure to include it in next year's budget. Past records show that Buda-Hubron Pole Hole Drills quickly pay for themselves out of savings.

Here are a few outstanding advantages:

- **Low first cost, operating cost and maintenance cost.**
- **Fast—drills holes 24 inches in diameter, 6 feet deep in 3 minutes.**
- **Economical on replacement work as well as on new construction.**
- **Mounted on truck, trailer or tractor.**
- **Drills in shale, hardpan, clay, frozen ground, etc.**

Let us show you how you can save money in 1940 with a Buda-Hubron Pole Hole Drill.

Write for Bulletin 868-W

Cash in on R.E.A. Work—Rent a Buda-Hubron Earth Drill — Write for details of rental program.

BUDA JACKS

The Buda Company has been building quality Jacks for over 30 years, and has available a wide range of sizes of cable reel, pole pulling, automatic lowering, hydraulic, journal and screw Jacks, in capacities from 1½ to 100 tons.

Write for Jack Bulletin No. 950-W.

THE BUDA CO.
ESTABLISHED 1881
HARVEY (CHICAGO SUBURB) ILLINOIS

Field Reports on Business

Prices have been more stable during the week, which is making for more confident buying. Purchasing agents are still cautious, but orders are keeping pace with shipments. Industrial activity continues to show expansion in most lines. Orders for heavy electrical equipment and diversified products have improved.

NEW YORK

The unusual war tactics being employed in the European conflict have resulted in a slowing down of orders. Incoming orders are about equal to shipments, which in most instances are higher than in previous months. Purchasing agents are still cautious in their buying. Prices are more settled now than in many weeks, which is making better market conditions.

This week Stone & Webster Engineering was retained by Carnegie-Illinois Steel to design and supervise the construction of a 32,000-kw. power plant and related distribution facilities at the Carrie Furnace plant in Rankin, Pa. The 450,000-lb. per hour steam-generating unit will be equipped to burn blast furnace gas and pulverized coal.

Talk in this area is centered around the automobile show, which is attracting large crowds. Record sales are expected during the new automobile sales year. Freer consumer spending is indicated by retail sales in all lines and crowded amusement centers. Electrical appliance sales are good, with new drives expected to boost sales to higher levels.

Industrial activity continues to show expansion. Private construction is being rushed for completion before colder weather. Plans are being discussed for several new housing developments. Last week engineering construction awards for the country were 44 per cent higher than in the same 1938 week.

NEW ENGLAND

A steady demand for heavy electrical equipment continues throughout this district, which, in view of large government contracts being allotted to manufacturing plants here, promises almost unpredictable upswings in employment, wages and improved buying in widely diversified fields of electrical products.

Last week large motor orders were reported; three 300-hp. motors were sold by one manufacturer, who also reports orders for five 75-hp. and several 50-hp. motors, all of which are for factory power expansion as the result of ordnance and naval orders. One group of 1,000 ¼-hp. motors was purchased by a prominent appliance manufacturer; motors for machines selling almost daily run from ½ hp. to 5 hp., according to one representative.

Negotiations have been completed and an order will soon be placed for a 7,500-kw. steam turbo-generator unit. Inquiries for and sales of small switch and control apparatus are being received in large volumes; watt-hour meter sales have taken a sharp spurt since September 1 and wiring supplies are moving rapidly.

Large contracts awarded during the past fortnight that will enlarge the sales volume of electrical supplies include an order for 65,000 rapid-firing rifles placed with the Winchester Repeating Arms Co., New Haven, Conn., orders for four submarines, involving $11,608,000 to the Electric Boat Corp., Groton, Conn., and large machine tool contracts to Brown & Sharpe, Standard Machinery Co., Providence, R. I.; Norton Co., Worcester, Mass., and others.

Merchandising is maintaining an even trend; small appliances are in good demand.

PACIFIC COAST

Electric appliance sales in northern California, a typical section, show increases for this year over last year of about 20 per cent in water heaters, 50 per cent in sizes 2 kw. and over in air heaters, 10 per cent in refrigerators, ironers and radios, and 25 per cent in cleaners. The September and early October hot spell will increase this refrigerator percentage.

Much new construction of transmission and distribution lines is reported, principally in the northwest, including allotments of $250,000 for 189 miles serving 759 families in Lewis County, Washington, and $194,000 for 179 miles serving 388 families in northeastern Washington; 20 miles of 33,000-volt transmission lines in Imperial Valley, Calif., and a $44,182 award for a sector of the Colorado-Big Thompson project. Miscellaneous private building includes a new Pacific Gas & Electric substation serving the University of California area in Berkeley.

Lighting business features school relighting in units which average a doubling of previous standards and many street lighting jobs, including 61 standards in Glendale, several $5,000 to $10,000 sections in the Bay region, such as $6,000 sodium lights for the Bay Bridge; a $28,738 Seattle award for Ballard Bridge approaches; $30,000 awards in Bakersfield and Los Angeles, and a $41,711 navy contract for special lighting on the fleet base oil tanks in San Diego.

CHICAGO

Electrical manufacturers report steadily increasing activity in practically every line. Makers of industrial equipment are especially active trying to meet the sharp rise in demand for apparatus resulting from the rapid expansion of industrial activity throughout this area. Wire and cable manufacturers are hard pressed to keep up with the sudden rush of inquiries and bookings. With machinery manufacturers experiencing such a rapid rise in production, there is an increasing demand for motors and control apparatus. In many cases the problem of immediate delivery is becoming acute.

Utility construction programs are moving ahead with increasing momentum. There is a considerable pick-up in orders for switchgear, transformers and a wide range of metering devices. Sales of welding equipment show substantial gains during the past few weeks. Wiring devices and fittings are moving especially well.

Commercial and industrial lighting equipment sales have improved considerably in recent weeks. Retail appliance sales are steady, averaging from 20 to 40 per cent over a year ago. REA allotments for the past four weeks total $1,423,000 for line construction in the surrounding area. Electrical power output in Chicago last week showed an increase of 1,002,000 kw.-hr. over the previous week.

IN TIMES LIKE THESE

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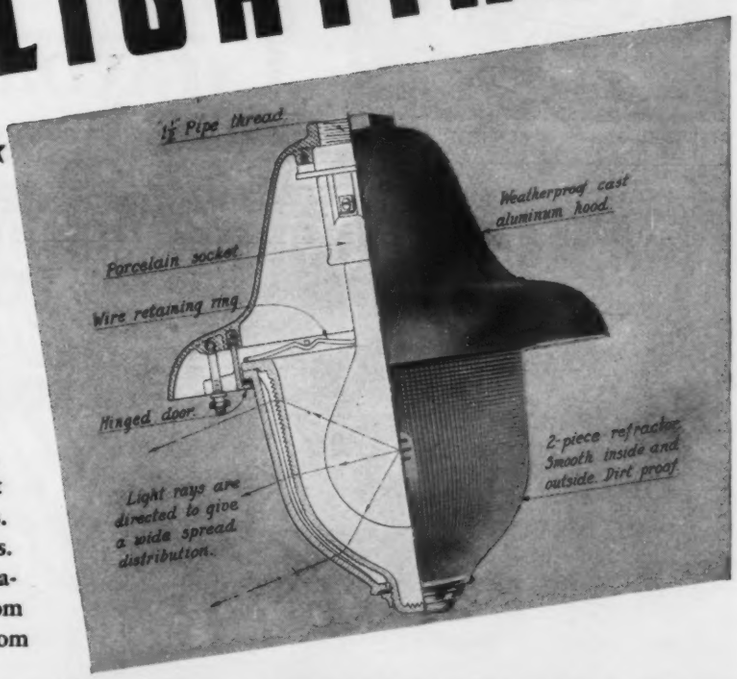
PROTECTIVE LIGHTING

HOLOPHANE REFRACTORS★ provide LOW-COST PROTECTION

(1/10¢ per square foot)

To thwart lawlessness, fire and theft during periods of emergency, plants are installing Holophane Yard Lighting Refractors . . . Specially designed for the use, these units are rugged, dependable and highly efficient for outside night lighting . . . Require no special towers or circuits. Built to withstand the most trying conditions. Trouble-free, dust-proof and resistant to deterioration. Made in sizes to take ordinary lamps from 100 to 500 watts . . . Available immediately from distributors' stocks in your locality.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Light rays are directed to give a wide spread distribution.

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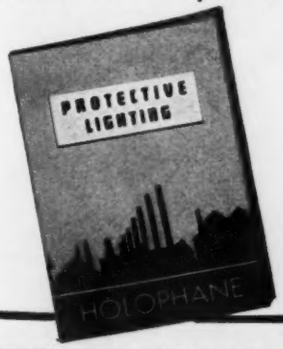

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The heavy mineral pitch base of this sturdy tape makes it highly resistant to all kinds of weather... sun, snow, rain or wind. Highly insulative and adhesive, this natural base tape will be very slow to dry out. A top-quality tape for outside jobs.

IN 1869 GRAY & BARTON
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CONNECTION COSTS COME DOWN

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SERVITS GO UP!

Speedily installed, Servits remain permanently secure under the most severe operating conditions. Result—*lower cost per connection!*

BURNDY

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Recent Rate Changes

MARYLAND PUBLIC SERVICE COMMISSION has accepted the new schedules of rate reductions of the Consolidated Gas Electric Light & Power Co. of Baltimore to be applicable after November meter readings. The new schedule calls for a reduction to electric consumers of $881,400 and to gas consumers of $127,100. The present reductions in rates will apply principally and generally to the electric domestic consumers and to the small electric commercial consumers. The electric primary rate for both domestic and commercial service in the Baltimore City rate district is reduced from 4½ cents net to 4¼ net, per kilowatt-hour; in the suburban rate district from 5 cents net to 4¾ cents net, per kilowatt-hour; in the outside rate district comprising all territory beyond the suburban district, from 6 cents net to 5¼ cents net, per kilowatt-hour. A reduction has also been made in the tertiary rate of the electric domestic schedules affecting domestic use only in all districts. This reduction is from 2.0 cents net to 1.2 cents net, per kilowatt-hour. One schedule instead of two will cover all uses for domestic purposes. The primary block of the rate to the small electric commercial consumer will vary in length in proportion to the connected load only for connected loads above 2¼ kw. Some reductions are provided also in the schedules covering the larger commercial consumers and certain municipal uses. A flat minimum charge of 75 cents per month applies to both domestic and commercial electric service.

KANSAS CITY POWER & LIGHT CO. has been permitted by the Missouri Public Service Commission to postpone until October 25 putting into effect new rate schedules cutting approximately $324,000 from the electric light bills in Kansas City. The new rates were to become effective October 1. The reductions were fixed in the valuation proceedings decided last August by the commission, when the lower rates were ordered.

COAST COUNTIES GAS & ELECTRIC CO., Santa Cruz, Calif., reduced its rates $180,000, divided $100,000 for gas and $80,000 for electricity users. The commission said domestic electric customers will save $49,800, commercial electric $13,400 and the remainder of the electric reduction will be divided between agricultural power, street lighting and general power charges. Electric rate reductions range from 5 to 12 per cent.

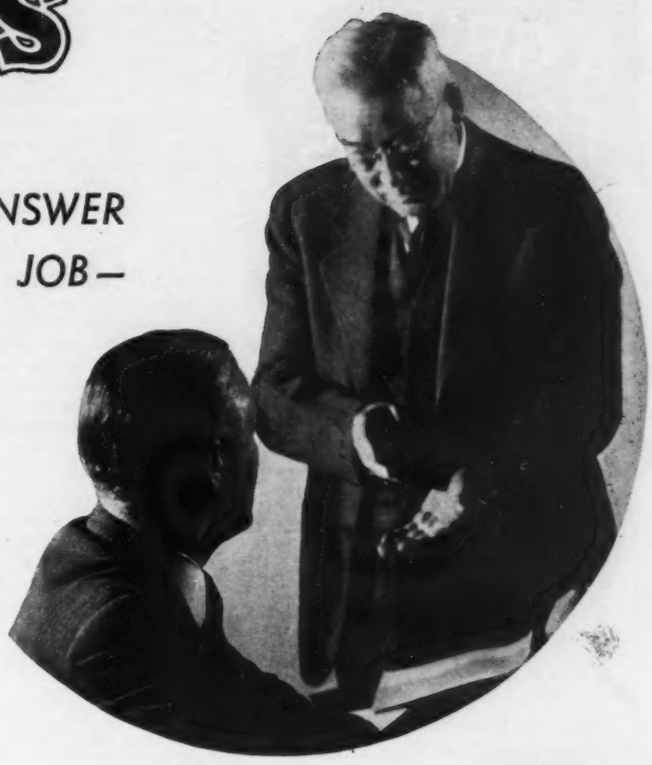
FLORIDA POWER CORP. has announced a rate reduction that will save consumers approximately $100,000, based on consumption over the last 12 months. The new rates will take effect with meter reading beginning November 1. The reduction affects the whole territory served by the company. Domestic power users will receive the lion's share of the estimated $100,000 annual cut, approximately $75,000 of the total applying to this class of customer. Commercial lighting classes will also benefit. The monthly minimum charge of $1 will continue to stand under the reduced rate, but it will buy 12 instead of 10 kw.-hr. First step in the domestic service rate, after the minimum is used will be 7 cents per kilowatt-hour, as against the 9-cent present rate. Large commercial consumers got a reduction under a rate that went into effect October 1.

EDWARDS LIGHT & POWER CO. has filed a general reduction of electric rates with the New York Public Service Commission which is estimated to save consumers of

"ILLINOIS PORCELAIN

PROVED TO BE THE IDEAL ANSWER FOR THAT LAST IMPORTANT JOB—

LET'S PROFIT THRU EXPERIENCE AND *STANDARDIZE ON ILLINOIS"*



When you see Illinois Porcelain used on today's most modern electrical equipment you know that the DIMENSIONS are EXACT — this is always true whether the quantity ordered was a few or many. You can be sure of HIGH MECHANICAL STRENGTH in every piece—this is a result of high quality materials and a specialized process of manufacture.

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A GRIP FOR ALL NEEDS

No. 1628-5 B. "Chicago" Grip. Maximum opening .563. Minimum opening .115. Safe Load, 8,000 lbs.

Here's the new "Chicago" Grip capable of handling messenger or guy strand from 3/16 in. diameter up to 1/2 in. diameter. A genuine all purpose grip that can also be used satisfactorily on bare conductors, solid or stranded, from No. 6 to No. 4/0 seven strand copper and A.C.-S.R. up to No. 3/0. A grip that even satisfactorily handles the new three-strand "copperweld" conductor. The bronze-lined jaws prevent slippage. This new grip will afford a sure hold under all conditions, with loads up to 8,000 lbs.

DISTRIBUTED THROUGH JOBBERS

Foreign Distributor: International Standard Electric Corp., New York

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The four pamphlets listed below will be sent without charge to anyone interested. Check the ones you want:

- ☐ Safety for the Pole Climber.
- ☐ Specifications on Linemen's Belts and Safety Straps.
- ☐ The Safety Factor on Linemen's Leather Goods.
- ☐ Pocket Tool Guide.

Mathias KLEIN & Sons
Established 1857 — Chicago, Ill. U.S.A.

3200 BELMONT AVENUE

the company about $660 annually. The company furnishes electricity in the village and town of Edwards in St. Lawrence County.

JEFFERSON, WIS., municipal electric utility has been authorized by the Wisconsin Public Service Commission to reduce its rates, effective December 1. The reduced rates will save domestic users $600 annually, business customers, $1,000 and power users $1,900.

•

Municipal Plants

BROOKLYN, IOWA—Citizens have voted three to one for erection and operation of a municipal light and power plant at a recent special election. They defeated a proposal to renew for 12 years an electric franchise to the Iowa Southern Utilities Co.

MONROEVILLE, OHIO—The long controversy over the proposed erection of a municipal power generating plant was finally settled, when the Public Works Administration refused a petition for a $35,000 grant. The village has been receiving its energy from the Ohio Public Service Co.

MT. HOREB, WIS.—Title to the property of the electric utility plant has been transferred to the village from the Mt. Horeb Electric Co., a subsidiary of the Wisconsin Power & Light Co. The village paid $70,319 to the utility company and has signed a long-time contract with the Wisconsin Power & Light Co. to supply energy. Frank W. Gates, formerly of Elkhorn, Wis., has been named manager of the Mt. Horeb plant, which will furnish electricity to approximately 700 patrons in the village and on two rural lines.

•

Denies Rehearing Plea in Jersey Power Case

Federal Power Commission has denied the petitions of New Jersey Power & Light Co. and Jersey Central Power & Light Co., asking rehearing on the commission's order of July 18 which found that the acquisition of 341,350 shares of the common capital stock of the Jersey Central Power & Light Co. by New Jersey Power & Light without prior order from the commission was a violation of Section 203(a) of the Federal Power Act.

Both petitions contended that the commission erred in finding that an electric utility whose lines are located wholly within a single state, but whose lines comprise part of the pathway by which electric energy is transmitted in both directions across state lines, is a public utility within the meaning of the Federal Power Act, and therefore subject to the jurisdiction of the commission.

•

Sets Electric Range Goal

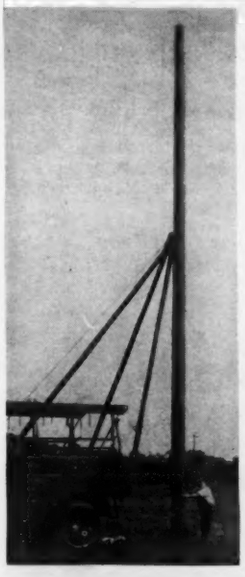
The Modern Kitchen Bureau has set a goal of 50,000 sales of electric ranges for its fall promotions.

Highway WINCHES

easier to use
SMOOTH OPERATION ASSURED UNDER HEAVY DUTY . . .

Available in several single and double drum models with various types of power take-offs and other equipment for mounting on any standard truck. Designed to insure light weight and simplicity combined with ruggedness and the ultimate in safety under heavy duty operation. Adopted as standard equipment by many utilities.

DERRICKS IN SIZES AND CAPACITIES FOR ANY HEIGHT AND WEIGHT OF POLE.



Highway pole derricks are made of a special heat treated seamless steel tubing and contain a high factor of safety and dependability under all operating conditions. Easily and quickly assembled and disassembled. Used as standard equipment by many utilities.

HIGHWAY TRAILER CO.
EDGERTON, WISCONSIN

Japanese Predetermine Faults in Cable

Methods of predetermining abnormal features of a defective cable are now being employed in connection with underground cables of the Tokio Electric Light Co.

Tests were carried on by a committee in the electrotechnical laboratories of the Japanese Ministry of Communications, states the *Japanese Electrotechnical Journal*. Samples of cables which had been in use for ten years were used. The best indications were afforded by the characteristics of high-tension continuous current. These included the variation during time periods in the escape of current, and under varying tensions the dielectric features of alternating current, the effect on the residual load due to a continuous tension, and the effect of escaping current on cable ends. Other tests, which brought about cable deterioration, were compared with known defective cables.

•

Change Locale of Hearing

Finding that the convenience of witnesses and parties will be served and conduct of the proceedings expedited by a change in the place of hearing, the Federal Power Commission has ordered that the hearing set for October 23 in the matter of the Bellows Falls Hydro-Electric Corp. and the Connecticut River Power Co. be held in Springfield, Mass., instead of in the commission's hearing room in Washington, as was originally ordered.

•

Air-Conditioning Orders

Orders booked for air-conditioning systems and equipment during August, as reported by 267 manufacturers, were valued at $6,358,441, as compared with $5,857,603 in July and $6,896,709 in June. For the first eight months these orders totaled $42,725,214; comparative statistics are unavailable for earlier years.

•

Air Unit Installations

Nineteen central-plant air-conditioning systems, with a combined capacity of 167 hp., were contracted for in Chicago in August, Commonwealth Edison Co. has announced. This compares with 22 installations aggregating 649 hp. reported in August, 1938. In addition to these central-plant systems, Chicago dealers sold 43 electric room coolers in August, 1939, as against 58 in the same month last year.

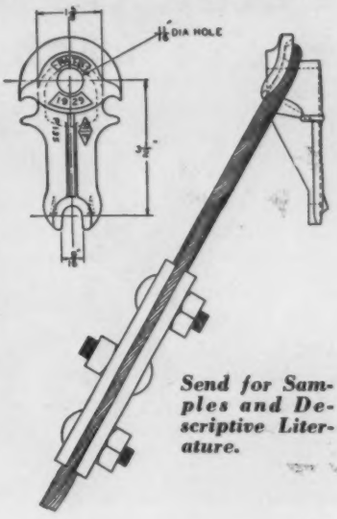
700,000 Installations Can't Be Wrong

The supplement with Electrical World issue of May 6, 1939, lists 145 Largest Generating and Distributing Systems in the U. S. 48 of these representative Companies and many other smaller properties regularly use M. I. F. Through-bolt Guy Hooks on exclusive or preferred specification basis. Investigation pays.

Guy Hooks— Three principal types in addition to the P134 Crossarm Guy Hook. P135 rated at 13,000 lbs. on ⅝" through-bolt is widely used for rural electrification. P133 rated at 20,000 lbs. on ¾" through-bolt. P132 rated at 40,000 lbs. on 1" through-bolt. Make up guy loops on the ground and save time of the whole gang. Prices as low as 15c each in quantity.

Eye Nuts and Anchor Rods— Thimbleless Eye Nuts for ⅝" bolt as low as 12c each in quantity. Larger sizes for ¾" and 1" bolts. Double Eye Nuts and various types of Bolt Eyes also available. Also furnished assembled and galvanized as unit on special steel rods of any desired length, rated at 80,000 lbs. per sq. in. at correspondingly attractive prices. These Eyes, used with standard stocks of through-bolts, round out simple specifications for pole-to-pole guys, etc., other than anchor type served by the Guy Hooks.

Curved Washers— Full line of Curved Ribbed Malleable Washers using the metal to better advantage than plate washers of uniform thickness, minimizing the pole-splitting stresses of through-bolt guying of any type, and strictly competitive as to price.



Send for Samples and Descriptive Literature.

Misc. M. I. F. Pole Hardware Specialties— *Williams Pole Mounts—Pole Stubbing Clamps—Aerial Cable Messenger Clamps and Insulated Hangers—Malleable Secondary Racks and Clevises—Malleable Crossarm Gains—Screw Anchors—Transformer Gain Plates and Kick Arms, etc.*

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Send Standard Handbook for Electrical Engineers for 10 days' examination on approval. In 10 days I will send $1.00, plus few cents postage, and $2.00 monthly for 3 months, or return the book postpaid. (Postage paid on orders accompanied by remittance of first installment.)

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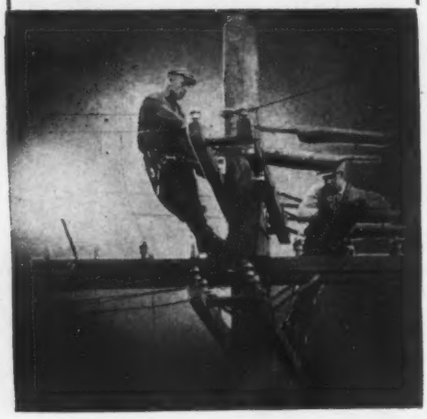
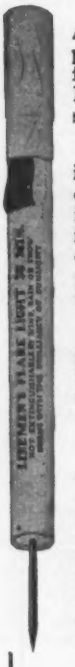
CENTRAL

Linemen's Flare Lights



"Packaged Sunlight" for night repairs and line patrol



A quickly available light—provides brilliant illumination for either 20 or 30 minutes. Not affected by wind, rain or snow.

Linemen's Flare Lights are invaluable during outages or other emergencies when quick illumination is imperative . . . ideal warning signals in case of truck breakdowns or when power lines are down on highways.

Equipped with friction cap ignition for instantaneous lighting — no matches required. Easily lighted in any weather.

Linemen's Flares can be stuck in a post, tree or in the cross arm of a pole, or in the ground where they afford ample illumination for safe, speedy work. Can be carried in the hand on line patrol. Regular equipment with many electric utilities throughout the United States.

Write for Prices

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No. 3020 20 min. 72 per case—63 lbs.	
No. 3030 30 min. 36 per case—50 lbs.	

Central Railway Signal Company, Inc.

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Sales Opportunities

CHARLESTON, S. C.—South Carolina Public Service Authority, Peoples Building, Charleston, will ask bids soon, closing on or about November 20, for power plant, lock gates and auxiliary structures for hydro-electric power development at Pinopolis dam site, Santee-Cooper power and navigation project, including generating station structure, three roller head gates and guides (each weighing about 50 tons), six sliding head gates and guides (40 tons each), two sliding tail gates (30 tons each), two sliding tail gates (7 tons each), trashrack (290 tons), two-leaf lower lock arch gates (490 tons), two-leaf upper lock girder gate (490 tons), four sets of lock gate machinery, four sets of lock valve machinery, emergency tainter gate, emergency gate machinery, tainter valves; electric controls and auxiliary electrical equipment, with wiring, for locks; and miscellaneous electrical and mechanical apparatus. Harza Engineering Co., 27 Cumberland Street, Charleston, is consulting engineer.

ESTHERVILLE, IOWA—City Council will receive bids until October 30 for equipment for municipal electric power plant, including generator with diesel engine drive, exciter, air tank and compressor, and complete auxiliary equipment.

ROANOKE, VA.—Appalachian Electric Power Co., Roanoke, is concluding negotiations for purchase of electrical distribution systems at Hamlin, Hurricane, Fort Gay and Louisa, Ky., and will furnish service in that area in future. Extensions and improvements will be made in acquired lines, with transmission line extensions and power substation facilities.

PONCA CITY, OKLA.—Continental Oil Co., Ponca City, plans installation of motors and controls, regulators, transformers and accessories and other equipment for expansion and improvements in local oil refining plant for increased capacity of gasoline and refined oil products. Present electrical system will be remodeled and modernized; electric pumping units will be improved and expanded. Entire project will cost close to $1,500,000. Executive offices are at 60 East Forty-second Street, New York, N. Y.

SANDPOINT, IDAHO—Northern Idaho Rural Electrification Rehabilitation Assn., Sandpoint, has plans maturing for hydroelectric power plant on Priest Lake, including power dam, generating station, switchyard and auxiliary structures. Also will build about 46 miles of primary and secondary lines in parts of Bonner County. Fund of $196,000 has been secured through federal aid, of which approximately $150,000 will be used for hydroelectric development.

BESSEMER, MICH.—City Council receives bids until October 31 for construction of a municipal electric power plant. Ayres, Lewis, Norris & May, Wolverine Building, Ann Arbor, Mich., are consulting engineers.

WASHINGTON, D. C.—Bureau of Yards and Docks, Navy Department, Washington, receives bids until November 1 for steel caisson gate for Panama Canal, including pumping machinery, piping and complete electrical equipment (Specifications 9449).

CORPUS CHRISTI, TEX.—Central Power & Light Co., San Antonio, Tex., has awarded contract for foundation excavation and piling for new steam-electric generating station in Nueces Bay district, Corpus Christi, recently referred to in these columns and will proceed with this work at early date. Alamo Iron Works, San Antonio, has award for steel piling. In near future, bids will be asked for power plant superstructure, switchyard structure and other construction. Also for miscellaneous equipment for plant. Sargent & Lundy, Inc., 140 South Dearborn Street, Chicago, Ill., is consulting engineer.

ST. LOUIS, MO.—Blanton Co., 318 Second Street, plans installation of motors and controls, conveyors, regulators, loaders and other equipment in new multi-story plant for manufacture of oleomargarine and kindred food products in vicinity of Dock Street, on river front, where site has been acquired. Cost estimated over $350,000.

SCOTTSBORO, ALA.—City Council has negotiations under way for purchase of local distribution system of Alabama Power Co., to be operated as municipal property in future, and plans line extensions and improvements, with additional power substation facilities.

BILLINGS, MONT.—City Council will take bids at once, closing about November 14 for ornamental street-lighting system in District No. 31, including metal standards, 28 15,000-lumen lamp units, underground cable and equipment, wire, etc. Kenneth Crysler is city engineer.

FRONT ROYAL, VA.—American Viscose Corp., 280 Madison Avenue, New York, N. Y., plans installation of motors and controls, power substation apparatus, conveyors and other equipment for expansion in viscose rayon mill at Front Royal, comprising several new units for large increased capacity. Completion is scheduled next summer. Cost reported over $2,000,000.

BROOKLYN, N. Y.—Signal Corps Procurement District, Army Base, Fifty-eighth Street and First Avenue, receives bids until October 27 for quantity of connectors and plugs (Circular 94); also, until October 30, for quantity of power units, panels, etc. (Circular 100).

BATON ROUGE, LA.—Standard Oil Co. of Louisiana, Inc., Baton Rouge, plans installation of motors and controls, transformers and accessories, electric pumping machinery, conveyors and other equipment in connection with expansion and improvements in local oil refinery, including several new units for large increased capacity. Work will be carried out over a period of months. Cost estimated close to $3,000,000.

GREENWOOD, S. C.—Greenwood County Finance Board, Greenwood, E. I. Davis, secretary, has plans maturing for new steam-electric generating station for standby service in conjunction with Buzzard Roost hydro-electric power development, now under way. Also plans early construction of power substation and switching station for transmission line system leading from hydro-electric station and tied in with new steam-electric plant. Work will begin soon on group of power substations for distribution service at Clinton, Laurens, Greenwood, Goldville, Newberry, Ninety-Six, S. C., and vicinity, where service will be furnished to a number of textile mills and other industrial plants. D. T. Duncan Engineering Company, Greenwood, is engineer.

OWENSBORO, KY.—City Council plans early call for bids for modernization and improvements in municipal electric power plant, including installation of additional equipment. Black & Veatch, 4706 Broadway, Kansas City, Mo., is consulting engineer.

LETTERS TO THE EDITOR

Caldwell Co-operative Meets Payments

To the Editor of ELECTRICAL WORLD:

My attention has recently been called to an article appearing in the ELECTRICAL WORLD dated August 12, 1939, under the head "REA Co-op in Red." Let me say that I was completely surprised that a publication enjoying the reputation the ELECTRICAL WORLD does would publish an article that has not a single word of truth in it. For instance, the Caldwell Mutual Corporation and particularly myself have never made a report of any kind to the North Carolina Rural Electrification Authority for the following very good reasons:

1. The North Carolina Rural Electrification Authority has no jurisdiction whatsoever over the Caldwell Mutual Corporation. The Caldwell Mutual Corporation was organized under a law passed by our Legislature in 1917 and not under the act of the Legislature which created our State Rural Electrification Authority in 1935.

2. Our State Rural Electrification Authority did not assist in organizing the Caldwell Mutual Corporation; nor did they give us, or offer to give us, any assistance whatsoever in the construction of our electrical distribution system.

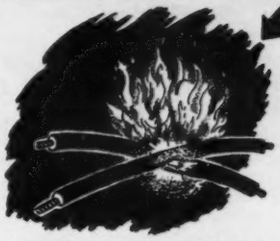
The statement in the article that despite a 75 cents amortization charge we are still operating in the "red" is untrue. Our first payment to the Reconstruction Finance Corporation was due March 1, 1939. This payment was met, all succeeding ones have been met, and all future payments are expected to be made promptly.

CALDWELL MUTUAL CORPORATION,
G. F. MESSICK, Project Sup't.

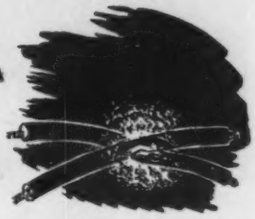
[It was stated at the REA offices in Washington that the Caldwell County project is an REA co-operative and that it had been allotted $905,000 and to date has actually borrowed about $800,000. The first monthly interest payment came due March 1, which was met along with subsequent payments to and including September 1. No principal repayments have yet come due. Repayment of principal on REA loans start on the 41st month.

It was also stated that Caldwell has never reported to the North Carolina Rural Electrification Authority. NCREA is an organization which REA dislikes. It was formed apparently in

Facts about Fire!



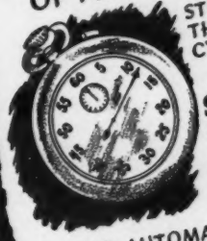
IT'S FLAME, NOT "GLOW,"
THAT DAMAGES ROTATING ELECTRICAL EQUIPMENT



WHEN YOU KILL FLAME NO FURTHER DAMAGE IS DONE, IF THE MACHINE IS CUT OUT.

CONTRARY TO GENERAL BELIEF, THE GLOW WHICH REMAINS WILL NOT EXTEND THE DAMAGE, UNLESS RE-IGNITION OCCURS.

SPEED IS THE ESSENCE OF FIRE CONTROL



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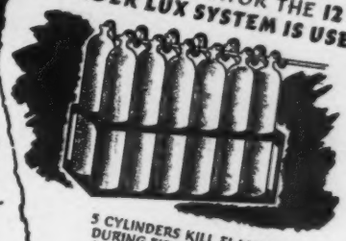
FIRE CONTROL LASTS 30 MIN. IN A TYPICAL 30,000 K.V.A. ENCLOSED GENERATOR THE 12 **CYLINDER LUX SYSTEM IS USED**



5 CYLINDERS KILL FLAMES DURING FIRST 15 SECONDS OF FIRE. 7 OTHER CYLINDERS DISCHARGE PERIODICALLY OVER 30 MINUTE PERIOD TO CONTROL GLOW UNTIL MACHINE HAS RUN DOWN.

Confine fire to the point-of-rupture by killing flame in the first 15 seconds. This is your best guarantee for uninterrupted service.

We have heard of a Lux-protected frequency changer which was back in service 3 days after a fire. Only split second fire control can give results like this.

Protect rotating equipment, oil switches, transformers, etc. with Lux Built-in carbon dioxide fire extinguishing systems. For small motors, lesser hazards, have Lux Portables ready at hand.

Write today for "LUX Makes the Difference." It describes LUX Built-in Systems for public utility plant protection. It gives you the highlights on LUX Portables. If you are planning new construction read this book thoroughly. Write today. Send the coupon.

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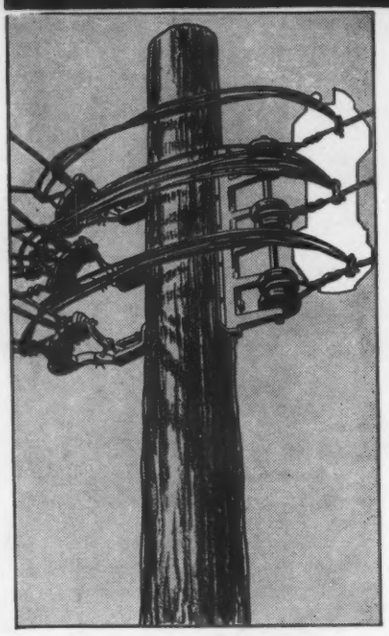

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One size accommodates No. 2 line wire and six No. 6 taps in a close fitting slot that assures dependable connections.

Reliable
ELECTRIC COMPANY
OVER 25 YEARS SERVICE TO THE UTILITIES
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an effort to keep local control over the projects. The Caldwell co-operative was organized under an old law.

REA states that the Caldwell project has had one extension of payment on its REA loan; this is the extension granted on all the 1935-36 loans and adopted by REA afterward. The local credit is considered good by REA.

On the 75-cent charge, REA advises that the normal minimum bill in the area is $2. Because of local poverty, Caldwell wanted to use a $1 minimum. REA would not allow this and suggested the project operate with no minimum. This was tried, but proved impractical. Against REA advice, the project adopted a 75-cent service charge plus the energy charge.

REA admits that Caldwell is one of its weakest co-ops. When the loan was made it doubted that it would ever be repaid, but it thinks now it will be. Project is still very weak, where any bit of bad luck would wreck it, but it is technically solvent. —EDITORS.]

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"Each Case Requires Special Study"

To the Editor of ELECTRICAL WORLD:

I have noted Mr. Gray's comments relating to my article on "Fluorescent Lamps Aid Air Conditioning."* It is known that the discussion of air conditioning is somewhat involved and to cover it completely together with lighting in a single article would be quite a task.

Mr. Gray's concluding sentence is, however, the crux of the entire subject of air conditioning, viz: "Each case requires special study." It is with this in mind that the article was written, in the hope to arouse interest in air conditioning and that those whose curiosity might be carried beyond this would refer to local offices of air-conditioning concerns, or to others whose knowledge falls within this field, for additional and more specific information.

To this extent I am glad to see Mr. Gray's comments published, so that no doubtful question will be left in the mind of any person interested in the application of air conditioning.

With regard to the cost of air conditioning, $600 to $800 has been given as a nominal average for an installed ton of refrigeration, disregarding the lighting equipment. Now, if the load can be reduced slightly by means of a more efficient lighting system, it will not follow necessarily that reduction in cost will be in line with the originally estimated installed value.

Certain sizes of air-conditioning equipment, such as condensing units, humidifiers, control systems, water coolers, etc., are required for a given installation, and if the load is reduced within certain limits much of this equipment cannot be reduced in size because of its own design specifications. Perhaps air and ventilating ducts and other minor types of equipment can be slightly smaller in size, and labor of installing these ducts and equipment, for one reason or another, may be less. Other variables may also enter, and it is upon this basis that a saving of $150 to $300 was cited when considering reduction of an air-conditioning system to a smaller tonnage.

In figuring operating costs, here again an over-all average was given. While maintenance is normally considered as part of the operating cost, electricity and water, as Mr. Gray states, are by far the most important items. It may be true that some installations may average 2 cents per ton-hour or even less, while at the other extreme it may exceed 5 cents, depending upon power and water rates. But, in general, the average of the country may be within 3 to 5 cents, which should be on the safe side for any one desiring a rough idea of operating cost.

The annual cost, of course, will depend upon the number of operating hours, and here locality, with all its variables, must be given due and thorough consideration. All of which reemphasizes the fact that every air-conditioning system, and lighting system, too, for that matter, requires special study and attention.

GEORGE J. TAYLOR,
Commercial Engineer
General Electric Vapor Lamp Co.,
Hoboken, N. J.

*"Electrical World," July 29, page 28.

Board Discharges Rule on Electricity Resale

Pennsylvania Public Utility Commission has announced that it has discharged its rule directing 62 Pennsylvania electric utilities to show cause why they should not include in their tariffs a regulation providing that no electricity be furnished to any consumer for resale to another consumer. Non-profit co-operative associations, utilities and municipalities were to have been excepted.

The commission will continue its action in some other form and instructed its law bureau to recommend at an early date the procedure to be followed to make effective the intent of the rule discharged now. About 25 utilities had filed preliminary motions with the commission to dismiss the complaint.

Recent Allotments Announced by REA

Announcement has recently been made by the Rural Electrification Administration of new allotments. Among them are the following:

COLORADO—Co-operative being formed, John C. Nixon, Greeley, correspondent, $230,000 to build 219 miles of line, 608 members in Weld and Larimer counties.

IOWA—Greene County Rural Electric Co-operative, Jefferson, Clifford F. Unz, supt., $384,000 to build 385 miles of line, 981 members in Boone, Green, Polk, Webster and Hamilton counties. Co-operative Electric Co. of Osage, St. Ansgar, Louis J. Vandermyde, supt., $143,000 to build 153 miles of line, 390 members in Worth, Floyd and Chickasaw counties.

KENTUCKY—Warren Rural Electric Co-operative Corp., Inc., Bowling Green, Lester Wright, supt., $151,000 to build 150 miles of line, 525 members in Simpson, Logan, Warren, Grayson, Edmonson, Ohio and Butler counties.

MAINE—Farm-Home Electric Co-operative, Inc., Patten, Howard Wood, president, $127,000 to build 108 miles of line, 381 members in Aroostook and Penobscot counties.

MICHIGAN—Presque Isle County Electric Co-operative Assn., Posen, Gustav J. Kleber, manager, $112,000 to build 101 miles of line, 366 members in Presque Isle, Alpena, Cheboygan and Montmorency counties.

MINNESOTA—Federated Rural Electric Assn., Jackson, Paul Ferguson, supt., $100,000 to build 107 miles of line, 286 members in Martin and Jackson counties.

OHIO—Licking Rural Electrification, Inc., Utica, Charles D. Dunlap, supt., $259,000 to build 273 miles of line, 882 members in Ashland, Richland, Knox, Licking and Franklin counties.

OKLAHOMA—Cotton Electric Co-operative, Walters, C. W. Cox, supt., $106,000 to build 120 miles of line, 408 members in Comanche, Stephens, Cotton, Jefferson and Tillman counties.

TEXAS—Magic Valley Electric Co-operative, Inc., Mercedes, J. E. Wilder, manager, $115,000 to build 144 miles of line, 404 members in Hidalgo, Willacy and Cameron counties. Lamb County Electric Co-operative, Inc., Littlefield, O. K. Woodall, supt., $120,000 to build 158 miles of line, 335 members in Lamb, Bailey, Hale, Hockley and Cochran counties. Greenbelt Electric Co-operative, Wellington, Orval B. Couch, supt., $100,000 to build 150 miles of line, 348 members in Collingsworth, Donley and Armstrong counties, Tex., and Beckham County, Okla. Mid-West Electric Co-operative Assn., Rotan, Andrew Jones, supt., $107,000 to build 142 miles of line, 421 members in Jones, Fisher, Scurry, Borden, Nolan and Mitchell counties. Lower Colorado River Electric Co-operative, Inc., Austin, C. A. McEachern, president, $400,000 to acquire 225 miles of line, 1,500 consumers. Tri-County Electric Co-op., Inc., Azle, M. H. Skidmore, supt., $117,000 to build about 156 miles of line, 411 members in Parker, Tarrant and Wise counties.

VIRGINIA—Community Electric Co-operative, Suffolk, Louise E. Davidson, president, $220,000 to build 239 miles of line, 796 members in Nansemond, Isle of Wight and Southampton counties.

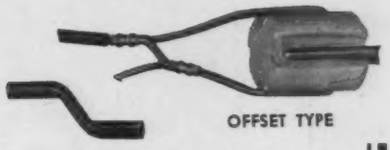
WISCONSIN—Waupaca Electric Co-operative, Iola, Louis R. Rasmussen, supt., $148,000 to build 139 miles of line, 376 members in Waupaca, Shawano and Marathon counties.

Some of the allotments that were

"It's the Best Ever"—

The *Nicopress* Method of Splicing and Dead-Ending . . .

For security—strength—and economy the Nicopress method of splicing and Dead-Ending is "tops" from every angle.



OFFSET TYPE

The outstanding advantages secured through the use of Nicopress sleeves and tools are:

- Simplicity of installation.
- All completed Nicopress Splices equal or exceed rated breaking strength of conductors.
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Hot Rolled Copper Rods • Bare and Tinned Strand
Bare and Tinned Copper Wire
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ROME-60

That New, Tough, 60% Jacketed, Heavy Duty Portable Cable

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CORPORATION
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SALES OFFICES:
New York Chicago Cleveland Pittsburgh Detroit
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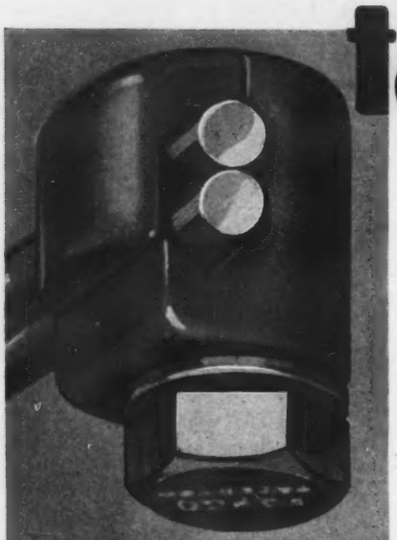

FARGO "6000" CONNECTORS

A streamliner in looks and action, that's this new Fargo "6000" Connector. Just hook it on the run-wire, insert the tap, tighten the bolt...and your conductors are gripped in perfect, permanent contact. Built as one unit with no parts to lose, the Fargo "6000" is simply, safely, swiftly handled. Fargo rugged construction, Fargo minimum friction between operating parts mean extra years of repeat use. Now available in No. 6 & No. 4 sizes, with other sizes available later.

MADE BY FARGO MFG. CO.
DISTRIBUTED BY
LINE MATERIAL CO.

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THE COLOR TELLS THE SIZE

The Utilities Choice

Central Stations everywhere recognize COLORTOPS as the standard for comparison because it alone offers such "Plus Values" as:

- Porcelain shock and vent-proof top
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- Large center contact rivet
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ELECTRICAL WORLD 330 W. 42nd St. N. Y. C.

made late last month by the R.E.A. follow:

GEORGIA—Satilla Rural Electric Membership Corp., Alma, Valene Bennett, supt., $194,000 to build 250 miles of line, 942 members in Wayne, Coffee, Jefferson Davis, Appling, Bacon, Ware and Pierce counties.

IDAHO—Raft River Rural Electric Cooperatives, Inc., Malta, J. Roy Eames, president, $111,000 to build 97 miles of line, 251 members in Cassia and Box Elder (Utah) counties.

ILLINOIS—Menard Electric Co-operative, Petersburg, A. E. Becker, supt., $105,000 to build 109 miles of line, 278 members in Mason, Sangamon, Menard, Tazewell, Logan, Cass and Morgan counties.

IOWA—Marshall County Rural Electric Co-operative, Marshalltown, Harry H. Frey, supt., $198,000 to build 211 miles of line, 506 members in Marshall, Story, Jasper, Lincoln and Tama counties.

KANSAS—Coffey County Rural Electric Co-operative Assn., Inc., Burlington, Lester J. Pilcher, supt., $102,000 to build 109 miles of line, 249 members in Coffey, Anderson and Franklin counties.

KENTUCKY—Fleming-Mason Rural Electric Co-Operative Corp., Flemingsburg, James K. Smith, supt., $188,000 to build 158 miles of line, 714 members in Mason, Fleming, Nicholas, Robertson, Greenup, Carter and Elliott counties.

MISSISSIPPI—Four-County Electric Power Assn., Columbus, Louis Wise, supt., $105,000, of which $75,000 is to be used in conjunction with a PWA grant to build about 200 miles of line, 400 members in Clay, Loundes, Oktibbeha and Noxbee counties, and a headquarters building; $25,000 to construct a community locker refrigeration plant; $5,000 to finance house wiring and plumbing installations.

MISSOURI—Co-operative being formed, C. C. Keller, correspondent, Springfield, $319,000 to build 311 miles of line, 1,049 members in Polk, Webster, Greene, Dallas, Hickory and Camden counties.

MONTANA—Yellowstone Valley Electric Co-op., Inc., Huntley, J. E. Pickens, supt., $74,500 to build 58 miles of line, 254 members in Yellowstone County.

NORTH DAKOTA—Red River Electric Co-operative Inc., Hillsboro, Ralph Diehl, president, $229,000 to build 240 miles of line, 416 members in Traill and Grand Forks counties.

OKLAHOMA—Kay Electric Co-operative, Blackwell, Adolph Knesek, supt., $62,000 to build 83 miles of line, 213 members in Grant, Kay, Osage, Noble and Garfield counties.

PENNSYLVANIA—Sullivan County Rural Elec. Co-operative Assn., Forksville, Wesley S. Thomas, supt., $14,000 to complete project and to defray certain expenses connected with the initial operations of project which cannot be covered by construction loan.

SOUTH DAKOTA—East Central South Dakota Electric Association, Flandreau, Louis Lorentson, correspondent, $132,000 to build 121 miles of line, 300 members in Moddy County.

VIRGINIA—Prince George Electric Co-op., Prince George, H. C. Ruffin, president, $135,000 to build 141 miles of line, 366 members in Prince George, Sussex and Surry counties.

WASHINGTON—Stevens County Electric Co-operative, Inc., Colville, Lee M. Glasgow, president, $326,000 to build 292 miles, 703 members in Stevens County.

WISCONSIN—Barron County Electric Co-op., Barron, Frank Havel, supt., $207,000 to build 198 miles of line, 687 members in Barron, Washburn, Rusk, Burnett, Chippewa and Polk counties.

Commercial Customer Surveys Show Attractive Potentials

[*Continued from page 50*]

tomers are too few to justify equipment specialization, but great enough to warrant two or more salesmen in a relatively limited area. Such a type of organization might be labeled as "intermediate" between the general line salesman operating in scattered areas and the full equipment (for example, refrigerator, lighting, etc.) specialization suitable for highly concentrated areas.

Another aspect of this difference in electrical requirements of various types of small business is its effect on advertising, both newspaper and direct by mail. It clearly points to the fact that a general line folder applicable to all lines of business is, because of its generalities, not sufficiently pointed to raise the interest of many customers in the benefits they personally can derive through increased use of electrical service. Regardless of the size of the utility, except those having very few commercial customers, there should be some specialization in advertising by broad groups of customers to make it more effective.

To summarize, while the small commercial customer has been a hard problem to handle from a load-building standpoint, it is important that this class be built up because, from a revenue standpoint, it comprises a valuable group of customers, being both relatively steady users, and taking in general a compensatory rate. However, in building any sales force to deal with this group, and in preparing advertising and promotional campaigns, it must be remembered that there is no such thing as the "average" or "typical" small commercial customer. To be effective, promotional and sales efforts must deal with these customers in groups according to their electrical needs, or else, in a still more specialized way, by individual types of equipment, such as lighting, refrigeration, air conditioning and commercial cooking.

•

More G. E. Stockholders

The number of stockholders of General Electric on September 22 was 209,853, compared with 208,805 a year ago, according to Gerard Swope, president.

Plain Hoss Sense
+ good basic quality
+ up-to-date design
= SUPERIOR
REG. U.S. PAT. OFF.
★ ★ PRODUCTS
THE SUPERIOR SWITCHBOARD & DEVICES CO.
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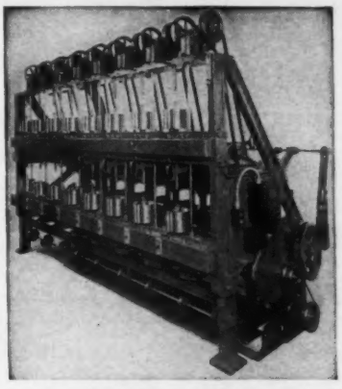

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Each Unit Individually Motor Driven
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"American" AIMCO INSULATING MACHINERY COMPANY
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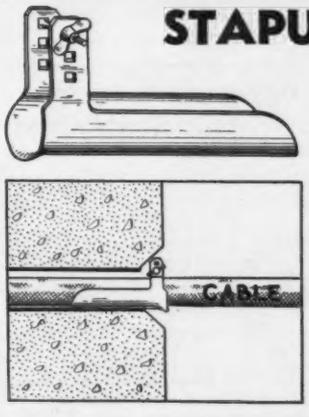
PHILADELPHIA, PENNSYLVANIA, U.S.A.



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Staput Fairleaders are especially designed to eliminate cable abrasions at the duct mouth. They save you money in the installation—cutting labor time to 2 minutes. Rigid laboratory tests indicate a service-life of *200 years!* Made of ZINC to protect lead cable covering from electrolytic action. Held firmly by cadmium plated bolt and wing nut. Standard in underground systems of many progressive light and power companies.
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GETTING ALONG WITH PEOPLE
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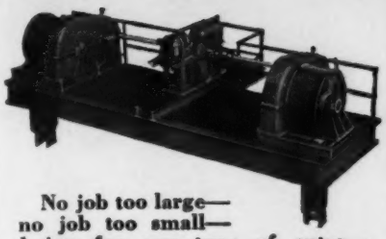

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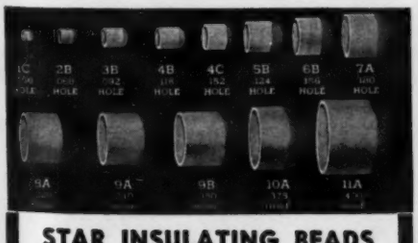

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STAR PORCELAIN CO.
TRENTON, N. J.

Operating Record Proves Value of Limiters

[*Continued from page 52*]

because only partial limiter protection had been provided.

All of the 100 limiters involved in the 63 cases of faults operated without any visible damage to the insulation which was applied over the arc-proofing shells. In fact, the limiters functioned with so little disturbance that there was no change in external appearance which would make it possible to differentiate between blown and unblown limiters.

Replacing Blown Limiters

When individual limiters are found blown they are cut out and replaced by new ones and where insufficient cable slack is available to make the new connection a small cable insert is introduced. In the cases of fusible crab joints, where a limiter has operated, that particular leg of the joint becomes useless and it is necessary to connect the circuit involved to an unused terminal if such is available. When spare terminals are not available, either an additional fusible crab joint may be interconnected with the old one, or, where space limitations prohibit, a completely new fusible crab joint may be used to replace the existing one.

While this operation may appear uneconomical, such changes are so infrequent and represent such a small number per year as compared with the total number of fusible crab joints installed that the cost of replacement becomes an insignificant item. The conclusion is, therefore, that provisions for individually replaceable limiter elements in fusible crab joints cannot be economically justified.

The authors gratefully acknowledge the assistance of O. B. Hudson and F. J. Heracek of the Consolidated Edison Company of New York, Inc., in the preparation of this article.

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August Output in Canada

Output of central electric stations in Canada in August totaled 2,291,425,000 kw.-hr., compared with 2,205,189,000 in July and 2,075,901,000 in August, 1938. Exports to the United States were 177,834,000 kw.-hr., compared with 162,973,000 in July and 149,493,000 in August, 1938.

Crapo GALVANIZED PRODUCTS

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▼ ▼
Telephone and Telegraph Wire

Crapo Galvanized Wire and Steel Strand can be spliced and served without injury to the heavy, protective zinc coating. The perfect adhesion of this tough, ductile coating to the wire enables it to withstand sharp bending and twisting, produces corrosion-resisting joints, makes for longer life, lower maintenance costs.

Crapo Galvanized Seven-wire Steel Strand and Telephone Wire are readily available in all standard grades and sizes from representative Supply Jobbers.

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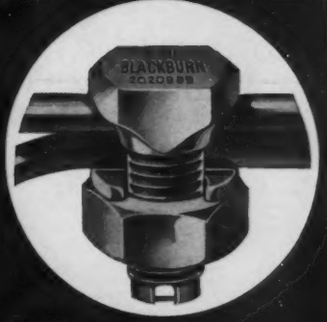

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are made completely of Duronze actually stronger than steel. They will not stretch and loosen. They will not season crack or corrode. In short—Blackburn Connectors are your protection against faulty joints.

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HARD PORCELAIN
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What Kind of Man Makes the Best Local Manager

[*Continued from page 53*]

local manager should keep himself informed on all current news—local and national—and in this he should have the assistance of his departmental heads and executives. Especially should he be supplied with all information pertaining to the industry that may affect his operations. There should be in every local manager's office a complete file of rates applicable to his territory, with a manual on how they should be applied; a manual on cash-handling procedure; one on the accounting policies with proper interpretation of account numbers; a manual on meter installation with diagrams of connections for all meters used, and a periodically corrected price list on all merchandise handled.

Executive Interest

There is no better way to train and keep good managers than for the executive to form the habit of holding meetings and visiting with them regularly, guiding and assisting them with their local problems and letting them know that the executive is their personal friend and ready to support them whenever needed.

Generally, we have found that the local managers who are most successful in their relations with customers are the men who have the lowest percentages of accounts delinquent and the lowest percentages of distribution losses. When a manager insists that bills be paid at the proper time and that all energy received at the substation meter, except, of course, the natural line and transformer losses, be recorded on customers' meters, the customers respect him for his good business management.

• •

Get Wiring Certification

The Electric League of Indianapolis becomes the 28th group to receive permission from the National Adequate Wiring Bureau to certify wiring installations. A. J. Callaway is chairman of the Indianapolis Adequate Wiring Committee, which will conduct the certification operations in the city of Indianapolis and Marion County. The National Bureau recently announced that certification is now being undertaken by industry groups in St. Louis and San Antonio.

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